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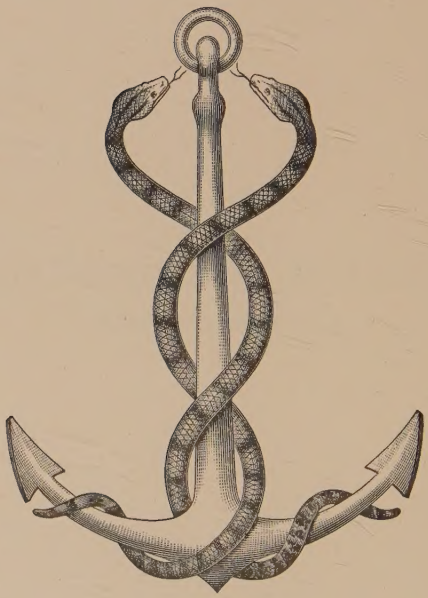
PRACTICAL AND OPERATIVE GYNECOLOGY.



NUNQUAM ALIUD NATURA, ALIUD SAPIENTIA DICIT.

PRACTICAL AND OPERATIVE

GYNECOLOGY

BY

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ILLUSTRATED WITH FIFTY-FOUR FIGURES.

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TO

PROFESSOR A. R. SIMPSON,

THIS WORK

IS

AFFECTIONATELY DEDICATED

BY HIS ASSISTANT,

THE AUTHOR.

PREFACE.

During the past six years it has been my privilege to engage in the work of teaching Practical Obstetrics and Gynecology in the University of Edinburgh. In this book I have recorded, with some degree of elaboration, the gynecological part of my instruction.

In bringing to an end my official connection with my Alma Mater in Medicine, I desire thus to memorialise my thirteen years' association with her, to make record of the many benefits conferred by her upon me, and to express gratitude for the happiness, the encouragement and the stimulus, which I have found in many friendships among colleagues and students.

In particular, I would express my great obligations to Professor A. R. Simpson, with whom I have been most closely associated in work. To his continued sympathy, unselfishness and generosity, I owe much. In dedicating this book to him I endeavour to acknowledge my great indebtedness to him, and to indicate the respect in which I hold him.

Various works have been consulted in the preparation of this book, especially those of Baldy, Halliday Croom, Chrobak, Alban Doran, Hart and Barbour, Hegar and Kaltenbach, Keith, Kelly, Kocher, Martin, Olshausen, Pozzi, Sänger, Simpson, Lawson Tait, Spencer Wells.

My sincere thanks are due to Mr. George F. B. Simpson for his kindness in correcting the proof sheets.

J. CLARENCE WEBSTER.

EDINBURGH, *September* 1896.

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PRACTICAL AND OPERATIVE GYNECOLOGY.

PART I.—CASE-TAKING.

PRACTICAL AND OPERATIVE
GYNECOLOGY.

CASE-TAKING.

The examination of a woman suffering from one of the diseased conditions peculiar to her sex is sometimes a very simple matter, but very often it is a difficult and unsatisfactory process. A physician may investigate the state of her lungs or nervous system with comparative ease, but when the region of the pelvis enters into consideration, exceptional tact and skill are, in many cases, essential to the acquirement of all the information that may be desired. It is most important that the investigation should be conducted so that the patient is convinced that she is being treated with the utmost consideration and delicacy. No definite method can be adopted for all cases. It is necessary to vary the method of procedure according to the nature of the case, the temperament and condition of the woman, as well as other factors. There must always be a judicious blending of the *suaviter* and *fortiter*. A physician may possess great knowledge regarding the pathology and treatment of diseases of women, but he will not make great headway in the practice of gynecology unless he ever appreciates

the subtleties and peculiarities of the psychical organisation of women. Delicacy, tact, patience, and judgment must be brought into employment. Thoroughness, also, must be particularly enjoined. Owing to the peculiar difficulties of gynecological examination, there is a constant temptation to be satisfied with an imperfect acquisition of facts, and there is no department of medicine in which more serious mistakes may ensue from want of thoroughness, than in gynecology. Finally, downright honesty should be the motto of the physician. There is no sphere in which there has been more dishonest practice, and it is not out of place to utter a strong protest against the crime practised by those who, for the sake of gain, trade on the fears which naturally fill the minds of many women when their reproductive apparatus is out of order, and who elevate into an unnecessary importance conditions which are but trifling.

In all first-class schools of medicine, students are taught to study their dispensary and hospital cases according to a systematic plan. Such a method is an admirable and necessary one on account of the training it gives, but it is needful to remind the student that, in private practice, the case-taking card may not, in many cases, be rigorously followed; he may vary his method for particular reasons in special instances.

The following plan is a somewhat modified form of the card used in the University of Edinburgh—drawn up by Professor A. R. Simpson—

ANAMNESIS.

1. Name; Age; Occupation; Residence; Married, Single, or Widow; Date of Admission.

2. Complaint and Duration of Illness.

3. General History of—(*a*) Present Attack ; (*b*) Previous Health ; (*c*) Diathesis ; (*d*) Social Condition and Habits ; (*e*) Family Health.

4. Sexual History.
   (1) *Menstruation*—
      A. Normal—(*a*) Date of Commencement ; (*b*) Type ; (*c*) Habit—
         Duration,
         Quantity ;
      (*d*) Date of Disappearance.
      B. Morbid—(*a*) Amenorrhœa ; (*b*) Menorrhagia ; (*c*) Dysmenorrhœa.
   (2) *Intermenstrual Discharge*—(*a*) Character ; (*b*) Quantity.
   (3) *Pregnancies*—(*a*) Number ; (*b*) Dates of First and Last ; (*c*) Abortions ; (*d*) Character of Labours ; (*e*) Puerperia ; (*f*) Lactations.

5. Local Functional Disturbances—(*a*) Bladder ; (*b*) Rectum ; (*c*) Pelvic Nerves and Muscles.

6. General Functional Derangements—(*a*) Nervous System ; (*b*) Respiratory System ; (*c*) Circulatory System ; (*d*) Digestive System ; (*e*) Emunctories.

PHYSICAL EXAMINATION.

1. General Appearance and Configuration.

2. Mammæ.

3. Abdomen—(*a*) Inspection ; (*b*) Palpation ; (*c*) Percussion ; (*d*) Auscultation ; (*e*) Mensuration.

4. External Genitals.

5. Per Vaginam—(*a*) Orifice ; (*b*) Walls and Cavity ; (*c*) Roof ; (*d*) Os and Cervix Uteri.

6. Bi-Manual Examination (Abdomino-Vaginal, Recto-Vaginal, Abdomino-Rectal, Abdomino-Recto-Vaginal, Abdomino-Vesico-Vaginal)—
   (1) *Uterus*—(*a*) Size ; (*b*) Shape ; (*c*) Consistence ; (*d*) Sensitiveness ; (*e*) Position ; (*f*) Mobility ; (*g*) Relations.
   (2) *Fallopian Tubes.*
   (3) *Ovaries*—(*a*) Size ; (*b*) Situation ; (*c*) Sensitiveness.
   (4) *Peritoneum and Cellular Tissue.*
   (5) *Bladder.* (6) *Rectum.* (7) *Pelvic Bones.*

7. Inspection of Vaginal, Rectal, and Vesical Cavities.

8. Use of—(*a*) Speculum; (*b*) Volsella; (*c*) Sound; (*d*) Dilators; (*e*) Curette; (*f*) Aspiratory Needle.

9. Physical Changes in—(*a*) Nervous, (*b*) Respiratory, (*c*) Circulatory, (*d*) Digestive, (*e*) Emunctory Organs; (*f*) Skin; (*g*) Bones.

DIAGNOSIS.
PROGNOSIS.
TREATMENT.
PROGRESS and TERMINATION.

ANAMNESIS.

It is most important that this plan should be carefully mastered by students. It is not to be hastily crammed at the last moment, immediately before their clinical examinations, nor to be held in their hands while taking a case, and used as a mere mechanical guide of procedure. A thorough mastery of the card involves a wide clinical knowledge, and the various divisions are arranged in a form convenient to the grouping of the details of information which we obtain for comparison with the records of past experience.

In Division I. there are some points of importance to be noted by students. The age of the patient must be determined, and the special disturbances which are found at puberty, during the period of sexual activity, and at the menopause, must be borne in mind. The occupation must be known; chiefly, in this connection, must we inquire whether the woman has too long hours, lifts heavy weights, stands too much, or works under unfavourable conditions. It is equally important, also, in certain other cases, to know whether the woman is one of those who have too little to do, or spends her life in idleness and excessive indulgence. The

place of residence is noted as a matter of routine, but in certain cases it may be of some importance in relation to the health ; thus, the patient might live in a district where rheumatism is prevalent, or she might have spent some time in a tropical climate.

In finding out whether the patient is married, single, or widowed, tact is necessary. Sometimes the patient volunteers the information, but generally it must be elicited. Awkward blunders are often made by students—*e.g.*, asking a widow if she has pain on coitus, or a newly-married woman as to when she last had a child. It must be remembered, also, that widows and unmarried may come as patients either in a state of pregnancy or suffering from some condition related to an immoral relationship.

The examination of such a case must be conducted most cautiously. The physician may be suspicious, but he must be very careful in his questions lest he should be mistaken. Moreover, he must be prepared for deliberate falsehood from many such cases, and he must take care not to be thrown into error. Also in cases where the physician suspects some venereal complication, he must frame his questions in the most careful manner in order not to arouse the suspicions of the patient, who may be an entirely innocent sufferer.

Division III. refers to some points which must be inquired into with care. The history of the illness of which the patient complains must be obtained most carefully. In some cases this is definite and distinctive enough to justify an immediate diagnosis, but in the great majority of gynecological troubles the indefiniteness of the history is most perplexing to the student. In the general run of cases

previous health is not minutely inquired into, but it is necessary that nothing important be overlooked—*e.g.*, if the patient had had rheumatic fever some years previously, the neglect to find this out and to examine the heart might lead to very serious consequences. Moreover, if the patient be married, it is most important to compare her health before with that after marriage.

Diathesis and family health are not particularly considered in a large number of cases, but sometimes they may have an important bearing. Hereditary tendencies must sometimes be noted—*e.g.*, mental diseases, tuberculosis, tumour-formation, hæmophilia. The social condition and habits of life are important points for consideration. Overwork, imperfect feeding, poverty, bad sanitary conditions, luxury, vicious living, care, and worry have an important bearing on many cases.

Division IV. requires to be considered with the greatest care and exactness. It deals with the sexual history. The normal menstrual history must be inquired into, and it is important that the student bears in mind all the variations found in connection with normal menstruation. I note some of these.

The date of commencement or period of puberty occurs at varying periods. It is influenced by various factors :—

Climate.—In temperate regions it occurs at the age of fourteen or fifteen ; in cold countries at a later period ; in warm ones earlier.

Environment.—Rich living and city life tend to the development of an earlier commencement.

Race.—Racial characteristics are preserved—*e.g.*, English

girls born in India menstruate as do those of their race, not at an early period like the Indians.

Heredity.—In some families peculiarities as to menstruation may be transmitted from generation to generation.

It must be remembered that there are variations in the method of the establishment of the function of menstruation—*e.g.*, it may take place gradually, intermittently, or suddenly. In some rare cases in our country menstruation may begin in childhood, at eight or ten, or may be delayed until the age of twenty, twenty-two, or even twenty-five. And these extremes may be found where the girl is quite healthy. In most cases of delay, however, there is some pathological cause. In particular, the serious condition of malformation of the genitals—*e.g.*, atresia vaginæ must be kept in mind.

Type refers to periodicity. It is the interval from the commencement of one to the commencement of the next menstruation (not, as is often said by students, "from the end of one to the beginning of the next"). In most cases the twenty-eight day type is found. In a small proportion the thirty day, the twenty-one day, and a few other types are found. In the great majority of cases the type is regular, the patient being healthy—*i.e.*, the number of days is always the same. But it must be remembered that in some women irregular types are found not associated with any unhealthy state. As an example, I may mention one case in which throughout a number of years the woman had a mixture of twenty-one, twenty-five, and twenty-eight day types.

Habit refers to the duration and quantity of the flow. Normally, considerable variations are found. Thus it may

last from two to eight days; occasionally for nine days, the woman being quite healthy. A very large number of women have a discharge of blood for about a week. The amount of discharge lost is normally from three to nine ounces. Generally, six or eight ounces are lost. The estimation of the quantity by means of diapers is unreliable, because of the variations in the habits of women as regards cleanliness. Some wear half-a-dozen where three would suffice, while others make three or four perform the need of eight or ten. Each woman, in a state of health, loses a fairly constant quantity at each period. On the average, perhaps, three or four diapers are used in twenty-four hours.

The date of disappearance of the menstrual function is a variable one. This cessation is one of the phenomena met with at the menopause, a period also known as the critical time, the turn of life, the change of life or the climacteric. In about 50 per cent. of women it takes place between forty-five and fifty; in about 25 per cent. between forty and forty-five; in about $12\frac{1}{2}$ per cent. before forty; in about $12\frac{1}{2}$ per cent. after fifty. In a few cases it may occur between twenty and thirty, or as late as between sixty and seventy. These advanced periods have been mentioned, but it is doubtful if they were not pathological. It is very rare to find a woman in a normal condition menstruating after fifty-five.

Stoppage of menstruation is not synonymous with change of life. It is merely one of many phenomena. The change of life may take place quickly or slowly. Usually its duration is from one to three years. It is most important that the student should bear in mind the various methods in which the menstrual function ceases, whether gradually,

suddenly, or intermittently; and he should remember the diseases which are apt to occur at this period of life and which may alter the normal menstrual condition.

It is often important to compare the menstrual function in the single and married state of the patient.

After the study of the normal, the morbid menstrual history should be investigated. It is of great importance that, at this stage, the student should be able to make a mental summary of the causes of the various abnormal conditions to be investigated.

Amenorrhœa means diminution or cessation of the menstrual flow. Students, as a rule, state in examinations that it is "stoppage of the flow;" this is only a partial answer. A woman, who normally menstruates for eight days, but who has gradually altered so as to menstruate for two days, is amenorrhœic, just as surely as if she had stopped altogether.

In this connection it is necessary, also, to emphasise the necessity of bearing in mind the periods of normal or physiological amenorrhœa—*i.e.*, the period before puberty, the times between the irregular discharges so common in many cases at the establishment of the menstrual function, the months of pregnancy, the time of lactation (though in some cases menstruation may occur during nursing), the intervals of the "dodging-period" at the change of life, and the period after the menopause. Another important point must be attended to in this relationship—viz., the difficulties in the determination of pregnancy from the menstrual history. It is most important that the student should attend to these. Normally, when a woman becomes pregnant, her menstruation ceases, and it is customary to estimate the duration of pregnancy from her last period. Moreover, the

history of the stoppage of menstruation in a woman should always suggest the possibility of pregnancy, particularly in a married woman. The student must bear in mind that a girl may become pregnant before she has ever begun to menstruate, that a woman may sometimes become pregnant during a period of amenorrhœa from some diseased condition, that it may occur during lactation and during the "dodging-period" of the menopause.

Further, irregularity of menstruation may interfere with correct calculation of pregnancy. Another set of cases presents difficulty—viz., those in which discharges of blood may take place during pregnancy—*e.g.*, in ectopic gestation, in pregnancy in one-half of a septate or bi-cornuate uterus, and in certain abnormal or diseased conditions.

If these important points be forgotten serious error may be committed—*e.g.*, a woman during the menopause suffering from dyspepsia and flatulence, with a history of eleven months' amenorrhœa, was sent to hospital as a case of spurious pregnancy, whereas an actual pregnancy of four months' duration was found in her. A sound has been passed into the uterus of a woman during lactation, and an abortion caused; as the patient was nursing it was not supposed that she would be pregnant, and a careless examination was made.

The following is a summary of the chief causes of amenorrhœa:—

1. Constitutional diseases or conditions which deteriorate the blood or interfere with nutrition—*e.g.*, anæmia, phthisis, Bright's disease, liver disease, &c.

2. Sudden emotion or fright, grief or much worry, change from one climate to another or from country to city life, exposure to cold.

3. Congenital conditions — *e.g.*, cretinism, mal-developments of uterus and appendages, atresia of genital canal.

4. Pelvic diseases—*e.g.*, atrophy of uterus, superinvolution of uterus, in some marked inflammatory conditions of uterus and ovaries, advanced cystic degeneration of the ovaries.

Menorrhagia means increased menstrual discharge, and may be expressed in terms of quantity or duration, or of both.

The variations normally found in women must be borne in mind. What is abnormal for one may be normal for another.

The causes are :—

1. Diseased states—*e.g.*, cardiac disease, cirrhosis of liver, Bright's disease, scurvy, hæmophilia, acute specific diseases.

2. Pelvic diseases—*e.g.*, ovaritis, salpingitis, inflammations, subinvolution, inversion, retroversion, fibroids, sarcoma, carcinoma of the uterus, incomplete emptying of the uterus after labour or abortion, hæmatocele.

Dysmenorrhœa means pain associated with the menstrual flow. Normally, in a certain number of cases no pain or discomfort is felt ; in the majority of cases a dull backache is complained of. The pains may be sharp or dull, dragging, down-bearing or labour-like, and may be in the loins, in the small of the back, in the pelvis, or shooting into the thighs. Pains may be felt at different times—viz., for a day or two before the flow commences, ceasing at the commencement ; for a day or two before as well as for the first day or two of the flow; during the first day or two of the flow only; during the whole extent of the flow ; during the last two or three days of the flow ; and for a day or two after the stoppage of the flow.

Dysmenorrhœa is found in many conditions—*e.g.*, chronic pelvic peritonitis and cellulitis, tubal disease, ovarian inflammation, mal-developments of sexual organs, inflammations of uterus, displacements of uterus, fibroids of uterus, membrane-expulsion at menstrual period, obstruction to outflow of blood.

Intermenstrual discharges are of various kinds.

Metrorrhagia means uterine hæmorrhage occurring at times other than the menstrual periods. In this connection must be remembered the irregular discharges of blood often found during the period of puberty before menstruation is well established, and also during the period of the menopause. The irregularity of type in certain women in a state of health must also be borne in mind.

Leucorrhœa is the most common intermenstrual discharge. In its most common form it is called popularly "whites." This discharge may proceed from vulva, bladder, vagina, cervix, or body of uterus. It may be variously coloured—*e.g.*, white, grey, yellow, green, &c., according to whether urine or blood be mixed with it, or according to the nature of the germs which may be growing in it. It is muco-purulent, these elements varying in different cases, or it may be watery and acrid. It may be odourless, or may have an odour, which in some cases may be extremely bad. The discharge may in some cases be mixed with blood or urine.

The **Pregnancy history** must be carefully considered. It is important to know the number of pregnancies, especially in relation to the duration of married life. Too frequent conception is a serious factor in several diseased conditions. The date of the first and last pregnancy must be known;

conception, before nubility is well established, is a condition which may lead to disturbed health.

It is especially necessary to know the abortion history of the patient, for to abortion and its consequences much ill health in women is due. The character of the labours must be known—*e.g.*, whether they were easy, prolonged, difficult, or whether they required the assistance of the physician. It is necessary not to be misled by the patient's statements in regard to this point. Often a patient will state that she had a bad labour, or perhaps will say that instruments were used when she has only had chloroform.

It is also necessary to inquire as to how the patient recovered from her labours—whether she had suffered from pelvic inflammation during the puerperium, whether she rose too early, worked too soon, carried her baby much. Some important gynecological troubles date from an abnormal puerperium.

Lactation has an important bearing on certain conditions, and the physician must know whether the patient nursed her children and for what length of time.

Coitus must be inquired into in some cases. It should only be done when absolutely necessary and with the greatest caution and delicacy. It may sometimes be difficult to elicit facts regarding some abnormal state—*e.g.*, dyspareunia, even though the patient has come to consult the physician for nothing else. Coitus may be impossible in certain cases. In the general run of such cases the condition is made known to the physician within a few weeks or months of marriage. The cause may lie with husband or wife. If with the latter, toughness of the hymen, malfor-

mation, dyspareunia or other conditions may be found. If the condition develops after some time of married life other causes must be thought of—*e.g.*, inflammatory conditions, new-growth formation, &c.

Excessive coitus may have an important bearing on certain conditions, but it is difficult to get information on this matter in many cases. Questions must be asked with the greatest delicacy. They are rarely necessary.

Sometimes a physician may suspect that a woman is doing injury to herself by using methods for preventing conception. It is difficult to find out the truth in such cases. Women who are guilty of this habit will readily tell falsehoods to a doctor.

An important abnormal condition to be considered is **dyspareunia**, difficult or painful coitus. This condition is a most important one in relation to the health and happiness of a woman. The causes to be kept in mind are many—*e.g.*, awkward attempts at coitus, disproportionate size of the male organ and vagina, imperfect development of the female parts, inflammatory conditions in vulva, vagina, uterus, pelvic peritoneum, cellular tissue, ovaries, and tubes; displacements of uterus, prolapse of ovaries, urethral caruncle, fissures of ostium vaginæ, or of anus, ulcers of rectum, piles, coccygodynia, tender carunculæ myrtiformes, vaginismus from whatever cause.

Local functional disturbances of bladder, rectum, pelvic nerves and muscles, form a very important field for investigation.

Very often the bladder symptoms are the most valuable in leading the physician to a diagnosis. To neglect this viscus may lead to very serious error.

The patient may have frequency of micturition. In this condition she generally requires to get up at night several times. Often a woman will say that she micturates too frequently when she is not troubled at night at all. It is necessary to distinguish between frequency of micturition and the dribbling of an over-distended bladder. The latter requires immediate attention and so must not be overlooked. Causes of frequency may be due to very acid urine or to nervous derangements, but it may be caused by pressure of the uterus, tumours and other swellings; there are also various bladder and kidney diseases which may cause this symptom.

Incontinence of urine may be complained of. This may be due to irritating conditions about the genitals or rectum —*e.g.*, worms in the rectum in children, to various nervous disorders, or it may be due to local weakness of the sphincters of the urethra, or to a fistulous opening into the bladder.

Retention of urine may be complained of. It may be due to some nervous derangement—*e.g.*, hysteria; it may, however, result reflexly from irritating causes in the urethra, vagina, perineum, or anus. Mechanical causes may exist—*e.g.*, calculus, the pressure of a tumour or of any other swelling against the neck of the bladder or urethra.

Dysuria, or pain associated with micturition, may be before, during, or after the act. It may be due to hysteria, to urethral caruncle, to inflammatory conditions in urethra or bladder, to fissure of the neck of the bladder, and to a few other causes.

The state of the rectum must be known. The frequency of defæcation should be found out. Often women will state that they are all right when the bowels move every three or

four days. If diarrhœa is present, its duration and nature should be investigated; sometimes it is caused by the irritation of an overloaded bowel. The various causes of these symptoms must be remembered, especially new-growths inside and outside the bowel; ulcerations, simple or malignant; and pressure from various conditions—*e.g.*, retroflexed and enlarged uterus, hæmatocele, inflammatory deposits. Pain associated with defæcation must be inquired into. It may be found before, during, or after the act, and may be due to anal fissure, ulcer, malignant disease, &c. Mucus or blood may be found in the motions, and the causes should be borne in mind—*e.g.*, ulceration of bowel, new-growth formation, piles, and other causes.

Disturbed function in the muscles which are in the pelvic floor is to be investigated. There may be a spasmodic condition of some—*e.g.*, the *sphincter vaginæ*. But the important points to consider are weakness and solution of continuity—*e.g.*, rupture of the perineal body. The most frequent cause of these is to be found in connection with child-bearing.

The state of the pelvic nerves is in the great run of cases only considered in regard to the production of pain, which is the commonest symptom among gynecological patients. This symptom may be but one of a series of hysterical phenomena, but it is often due to inflammation in uterus or appendages, peritoneum or cellular tissues, pressure of new-growths or other swellings. But the patient may also complain of numbness, cramps, and hindered movements in the lower limbs.

The last Division dealing with functional derangements of the various systems of the body requires a little attention.

In a great many gynecological troubles no routine examination is made of these systems. Perhaps too often is there carelessness in this direction, and it may be necessary to warn the physician in regard to it. It is of the utmost importance that no condition be overlooked which might have some bearing in relation to the symptoms of which the patient complains, or to the course of the affection.

For example, a case with symptoms pointing to cystitis has been treated as a purely local affair, and it has turned out afterwards that the symptoms were really due to tubercular disease of the kidneys.

Of all the systems, I desire particularly to point to the *nervous* and *alimentary*, as being of chief importance. The disturbances of the nervous system known as neurasthenia and hysteria, in all degrees of their manifestations, must be kept in mind in the consideration of every gynecological case.

In very many cases symptoms are referred to the pelvis, which have no local significance, but which are merely part of an extensive range of abnormalities due to the abnormal nervous state. Or, in such a state, pelvic symptoms which have been slight may become enormously exaggerated.

Much error has been committed in practice by concentrating attention upon the local and forgetting the general—the very worst possible course to pursue. Such a case, after having undergone various tinkerings in her genital tract without improvement, may sink into a condition from which only the most judicious treatment can raise her.

Various disturbances of the alimentary system, especially dyspepsia and constipation, are to be inquired into. The relationship between these conditions and symptoms referred

to the pelvis is important; also the relationship between pelvic troubles and reflex disturbances of stomach and bowel functions are matters of the highest importance in treating disease in women. Sympathetic or reflex symptoms are very common.

PHYSICAL EXAMINATION.

General Appearance and Configuration.

The physician should note while the patient is walking, sitting, or standing, or during the rest of the examination, whether there are any deformities to be seen—*e.g.*, of spine, pelvis, or lower limbs. Such conditions are important in relation to child-bearing. Abnormalities of gait and posture should also be looked for; also, pendulous belly, swellings in the abdominal region. The condition of the face must be noticed—*e.g.*, it may indicate a neurotic temperament or malignant disease or some other trouble.

Mammæ.

In examining the mammæ, the following points must be noted—viz., size, general or local swellings, amount of fat, consistence, tenderness, venous enlargement; the condition of the nipple, whether prominent, retracted, tender, fissured; prominence of sebaceous glands around nipples—the so-called tubercles of Montgomery. Pigmentation should be noted; whether there be the primary areola round the nipple or, as well, the secondary areola outside the former. The presence or absence of colostrum or milk. In compressing the breast to make this out, use both hands and gradually squeeze the gland from the periphery to the nipple.

In some cases—*e.g.*, unmarried girls in whom pregnancy is expected, one may sometimes, at an early stage of examination, desire to know the condition of the breasts. In order not to arouse any suspicions on the part of the patient, it is best not to squeeze the gland at once, but to palpate it, inquiring for painful areas; while so employed one may be able to find out whether any milk be present.

Abdomen.

For the examination of the abdomen, the patient must lie on her back on the couch or examination table. In exposing the skin-surface two methods may be employed. The most thorough is the following:—The patient loosens the waist-fastenings of her dresses and skirts. Lying on her back, her body is covered with a rug. Under this cover the skirts are drawn down to the level of the pubes. The upper margin of the rug is then placed just above the mons veneris. The bodice and corsets are next loosened in their lower part, and the chemise drawn up, so as to leave the abdomen quite bare. A less thorough method is to draw the patient's clothes up under the rug as she lies on her back. The rug is then turned down, without exposing the hairs of the *Mons Veneris;* the skirts are pulled up by the patient and a considerable portion of the abdomen is exposed.

Inspection.—The following points should be kept in mind in looking at the abdomen:—The shape, general or local swelling, state of nutrition, retraction; the condition of the umbilicus—*i.e.*, whether it has the normal dimple, whether flattened or projecting; striæ, old or recent, due to stretching of the abdominal walls from various causes—*e.g.*,

pregnancy, tumours, &c.; pigmentation; distension of veins in wall; pulsations; influence of respiration on swellings; movements of fœtus in pregnancy, which may first be seen about mid-term in thin-walled women; movements of intestines in thin-walled women.

Palpation.—Patient's knees should be drawn-up, and she should breathe quietly with open mouth, or should sigh deeply. The hands of the examiner should be well-warmed, and should only gradually be applied to the abdomen. It is best that the patient's bladder and rectum should be emptied beforehand.

The palpation should be gentle though firm. If it be desired to adopt the method of suddenly forcing the finger-tips into the abdominal wall, it should not be adopted until gentle palpation has been done. Often if the patient be forcibly palpated at first, she will not relax the wall afterwards.

In some cases the whole abdomen must be examined carefully, and the student should not forget the nine areas into which the abdomen is divided.

By palpation we may gain information regarding the following:—Consistence of walls, state of nourishment, tenderness, tension; presence of tumours, their size, nature, mobility, relation to respiration, attachment to abdominal wall, relation to pelvis; presence and nature of other swellings—*e.g.*, ascites, herniæ, glandular enlargements; fœtal parts, ballottement.

Percussion.—It is important to bear in mind the necessity of light as well as of forcible percussion. It is always best that bladder and rectum should be emptied beforehand. We gain information by this method regarding the

size and position of the viscera; outlines of swellings and the relations of intestines to them; differential diagnosis between free abdominal fluid and tumours—*e.g.*, ovarian or fixed masses of abdominal fluid.

Percussion of the abdomen may be made while the woman sits or lies on her side.

Some recommend distending the bowel by gas or fluid in order to make more evident its extent for the purpose of comparison with some swelling under consideration.

Auscultation.—This method is applied to the abdomen for the purpose of making out the following:—Fœtal movements, which may be heard several weeks before the mother can feel them, fœtal heart sounds, fœtal heart murmurs, funic souffle; uterine souffle of pregnancy; souffle of fibroids; pulsation of aorta; friction sounds of roughened peritoneal surfaces rubbing together; gurgling murmurs due to gas and fæces in the bowel, the succussion murmur, the cracking sounds made by the bursting of small bubbles in the intestine.

Some of these intestinal sounds are often mistaken for friction sounds.

Mensuration.—Measurements of the abdomen are made chiefly with reference to the estimation of the size of abdominal swellings, especially for the purpose of estimating their increase or diminution in size during a period of weeks or months. A measuring tape is generally sufficient, but a cyrtometer, made of strips of flexible lead, may also be used. It is necessary to make definite measurements—viz., from the ensiform cartilage to the pubes; from the umbilicus to the ensiform and to the pubes; from the umbilicus to the anterior superior iliac spines; from the ensiform

to the anterior superior spines, around the body at the level of the umbilicus—the greatest circumference; from the tip of the spine of a vertebra to the middle line in front.

In order that the comparisons from time to time may be exactly made, it is necessary that the patient should always be measured in the same position; the bowels should not be distended with gas and fæces; the diminution or increase of fat on the body wall should be taken into account.

In some cases a complete and satisfactory examination of the abdomen can be made only when the patient is under an anæsthetic.

Examination of External Genitals.

It is not necessary to inspect the external genitals as a routine practice. It should be done as little as possible in ordinary consultation-room work. The patient is placed on a couch, her feet being opposite a window. She is covered with a rug, and, after her knees are drawn up, the clothes are pulled up under the rug, and the pudenda exposed.

The lithotomy position may also be used, but only where absolutely necessary. This is undoubtedly the most convenient position when an anæsthetic is employed. For thorough examination of the parts, the labia must be separated with the fingers. The following conditions should be looked for:—Malformations, varix, œdema, pigmentation, discharges, inflammation, fissures, venereal or malignant disease, swellings, injuries, state of the hymen, state of the urethral orifice. The patient may be asked to cough or

bear down in order that the effect on the perineum or vaginal walls may be noted.

Examination per Vaginam.

The patient is placed on her left side on a couch, a light rug being thrown over her body and lower extremities. She should then bend up her knees, and the dress should be drawn upwards somewhat under the rug. (It is always best that the bladder and rectum should be empty during examination.) The physician's hands should be thoroughly cleaned. If the case is one in which there is some discharge of blood, they should be made aseptic. The first two fingers should be anointed with vaseline, oil, glycerine or soap and water, and are directed under the rug, bent into the palm of the hand in order not to soil the patient's clothes, and carried to the fold between the buttocks. The examiner must avoid the region of the clitoris. The student must be particular to begin well to the back in the region of the anus, and to pass the fingers carefully forwards. When the anterior edge of the perineal body is reached, both fingers may be at once inserted into the introitus vaginæ, if there be no doubt that it is large enough—*e.g.*, in a multipara. In a doubtful case—*e.g.*, in a nullipara—only the forefinger should be at first used. In introducing, the finger-tips should not press the anterior parts against the symphysis, and the clitoris should not be touched.

In passing the fingers upwards, they should be directed into the hollow of the sacrum, the perineum being pressed backwards in avoidance of the anterior delicate structures. In a case where the introitus is small, it is often advisable

to ask the patient to bear down strongly while the finger is being gradually pushed upwards.

The following points are to be borne in mind during the examination :—size and tenderness of the introitus vaginæ ; condition of hymen or carunculæ myrtiformes ; integrity of perineum ; abnormal or diseased conditions of external genitals ; size, temperature, moisture, rugosity, smoothness, distensibility of vaginal walls ; sensitiveness, swellings in or outside the walls ; polypi or other structures in the cavity ; solutions of continuity in the walls ; state of urethra, base of bladder and ureters ; condition of rectum ; size and state of cavity and outlet of bony pelvis.

The size, shape, and consistence of the vaginal portion of the cervix are noted ; its mobility ; whether it is split or intact ; whether it is abnormally directed.

The size, shape, and consistence of the os uteri are to be made out. The condition of the fornix or vault of the vagina is to be noted, but it is to be borne in mind that the investigation of conditions outside the vagina, which may be in relation to the fornices, is best carried out by means of the bi-manual examination.

Of course the vaginal examination may be done when the patient is in the lithotomy position, but in the consultation-room only the lateral position is necessary.

It is necessary to be careful with regard to the examination of certain cases. If a mistress demands a vaginal examination of a servant who is suspected to be pregnant, the physician should refuse. If an unmarried woman, having been accused of illicit connection, asks for an examination and a certificate that she is not in the family-way, it is best not to accede to her request.

Bi-manual Examination.[1]

This is the most satisfactory method of gaining information with regard to pelvic conditions: -There are several varieties of this method—*e.g.*, abdomino-vesical, abdomino-vaginal, abdomino-rectal, abdomino-vesico-vaginal, abdomino-recto-vaginal, abdomino-recto-vesico-vaginal. The most commonly employed is the abdomino-vaginal, and this will be considered first of all. In every case the bladder and rectum should be empty.

Abdomino-vaginal bi-manual.—In consulting-room practice, the following method is the best to adopt. The patient is placed on a couch on her left side, and the vaginal examination performed, according to the method just described. The fingers being still in the vagina, the patient is asked to turn from the lateral to the dorsal position. It is best that the back should rest on a plane which slopes upward somewhat towards the head. The knees should be drawn up and well separated. The physician's warmed left hand should be placed on the patient's abdomen, the finger-tips at the umbilicus. The patient should breathe quietly and deeply with her mouth open. If she restrains her breathing she should be asked to make deep sighs.

This hand is then gradually pressed downwards and backwards towards the inlet of the pelvis, the ulnar edge rather than the surface being towards the abdomen. The fingers of the right hand which are in the vagina are pushed

[1] The honour of first having pointed out the importance of the bi-manual belongs to N. Puzos, a French accoucheur of the eighteenth century.

well upwards until they touch the fornix and the cervix. The last two fingers of this hand are flexed on the palm or lie in the hollow between the buttocks. Students often make the mistake of placing the outer hand on the symphysis and pushing downwards and backwards immediately above it, in this way disturbing the position of the uterus.

The examination should be conducted in the most systematic manner.

The uterus should at first be made out—its size, shape, consistence, sensitiveness, position, mobility, and relationships determined.

The Fallopian tubes and ovaries should be investigated with regard to the same points. In normal cases, unless the abdomen be very thin-walled, the tubes are not often felt.

The peritoneum and cellular tissue within reach of the examining fingers should next be palpated in regard to deposits, collections of fluid, tumours, old cicatrices, sensitiveness.

The bladder may be palpated in regard to sensitiveness, inflammations, thickenings, tumours, calculus, distension or thickenings of ureters.

The anterior part of the rectum and the condition of the recto-vaginal septum may, to a certain extent, be examined by the vaginal fingers, but for thoroughness the recto-vaginal examination should be made.

The condition of the brim of the cavity and of the outlet of the bony pelvis may be made out—abnormal measurements, deformities, enlargements of bone, shape, mobility and tenderness of coccyx, condition of sacro-sciatic ligaments and levator ani muscle.

The student, in particular, should bear in mind the following points in making the abdomino-vaginal treatment:—Through the anterior fornix one may feel for the body of the uterus, the bladder, ureters, round ligaments; rarely a pregnant Fallopian tube, a prolapsed ovary, a blood-extravasation, inflammatory effusions, may be found; sometimes a sub-peritoneal fibroid. When the uterus is retroverted, coils of intestine will be found in the utero-vesical pouch.

Through the posterior fornix the following may be distinguished:—fæces or other swellings in the rectum; blood or inflammatory deposits in the peritoneum or cellular tissue; prolapsed tubes and ovaries, normal or enlarged from various causes; retroverted body of the uterus; fibroid of posterior wall of uterus; malignant growths; ascites.

Through the lateral fornices the state of the broad ligaments, tubes, and ovaries may be investigated in regard to cysts, tumours, inflammations, cicatrices, blood-extravasations, &c.

Finally, it must not be forgotten that in the pelvis may occasionally be found certain abdominal organs or growths in connection with them—*i.e.*, the kidneys or spleen; also growths of omentum, bowel, peritoneum, &c.

The abdomino-recto-vaginal examination is more valuable than the method just described, not only because the condition of the rectum is investigated, but because the rectal finger can explore the condition of the posterior part of the pelvis so easily through the thin rectal wall. It is not a pleasant method either for patient or physician, but it should be employed in every case where the other bi-manual examination is not satisfactory. Having finished the ordinary bi-manual, withdraw the middle finger from the vagina, and

pass it gradually into the rectum. It should be passed well up through the folds of the third sphincter $1\frac{1}{2}$ inches above the anus; these sometimes obstruct the finger.

The abdomino-vesical and **abdominal vesico-vaginal** examinations are made chiefly for the investigation of bladder conditions, and will be considered later (p. 33).

The abdomino-recto-vesico-vaginal examination is very rarely employed, and is practically unnecessary.

The abdomino-rectal examination is important. It is carried out in virgins when it is not considered advisable to pass a finger through the hymen, in atresia or narrowness of the vagina, in cases in which a tumour fills the vagina, in shortness of the vagina, in malformations of the internal genitals, for the purpose of studying the condition of coccyx, rectum, or recto-vaginal septum.

The forefinger is used. It should be lubricated, and gradually passed through the anus with a slightly rotatory movement. With it the state of the sphincters, sensitiveness of the parts, the presence of fissures, tumours, piles, or prolapsus may be made out. Above the anus the wide ampulla is entered, and the third sphincter passed. The following structures may then be palpated: — Posterior vaginal wall, cervix, posterior part of body, utero-sacral and broad ligaments, tubes, ovaries, posterior bony wall of pelvis; also, pathological conditions in these various structures.

Those who have not been accustomed to this method of examination are at first generally in doubt as to the relations of the uterus; the cervix may be mistaken for the body or for a tumour.

Bi-manual examination must be conducted with special

care in acute inflammatory conditions, in recent blood-extravasations, in distended tubes, in ectopic pregnancy, in all thin-walled cysts, in advanced cancer of cervix or rectum.

In a great many cases a satisfactory examination can only be obtained when the patient is anæsthetised—*e.g.*, when she is very fat, when she keeps the abdominal wall rigid, or when there is much tenderness or pain.

When under the anæsthetic, the patient should be examined in the dorsal or lithotomy position.

Examination of Vaginal, Rectal, and Vesical Cavities.

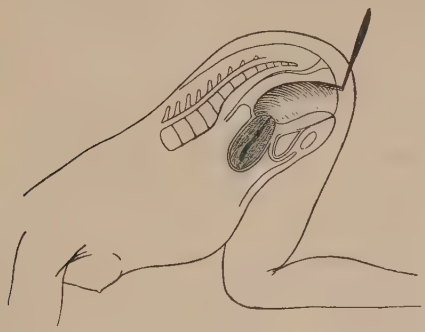


Fig. 1.—Genu-pectoral position. A speculum is placed in the vagina.

Vagina.—The vagina may be exposed and examined by means of the speculum. I will consider this method when describing this instrument. The canal may be inspected without the use of a speculum in two ways :—

(*a*) If the patient be placed in the genu-pectoral position, and the introitus opened with the fingers, air rushes in, and the canal becomes distended. (The physics of the

abdomen and pelvis have been fully worked out by Simpson and Hart.) If the perineum be held back by a finger, and the light from a window or an artificial light be reflected into the vagina, its walls and the vaginal portion of the cervix may be well seen.

(*b*) If the patient, while in the lithotomy position, have her hips elevated somewhat, and the introitus be opened, air rushes in and distends the vagina, while the uterus gravitates towards the promontory. By means of a reflected light the cavity may be examined while the labia are separated and the perineum is pulled back.

Rectum.—(*a*) *Digital method.*—I have already described the method of examination by means of a finger. (Simon has recommended the introduction of the whole hand. Such a barbarous method is never necessary, and must be condemned.)

(*b*) *Storer's method.*—The patient is placed on her side with her knees drawn up, her buttocks being opposite the source of light. One or two fingers are passed into the vagina, and pressure is made downwards and backwards through the posterior vaginal wall; if, at the same time, the anus be opened with the fingers of the other hand, the anterior rectal mucosa can be everted and made visible.

(*c*) *Hart's method.*—The patient is placed in the lithotomy position, and the pelvis elevated somewhat. If the anus be opened with the fingers or with retractors, the air rushes in, dilating the lower part of the rectum. The walls may be examined by means of sunlight, or by reflected artificial light.

(*d*) *Genu-pectoral position.*—In this position, if the anus be opened, the air rushes in, distending the rectum. If the

anus be kept widely opened by means of the fingers, or with retractors, the interior of the bowel may be studied by means of sunlight, or by reflected artificial light.

(*c.*) *Use of a tubular speculum.*—The rectal speculum is of the tubular variety; its inner surface should be a reflecting one. On one side is a fenestra. The instrument may be made of polished metal or of glass, silvered, and covered with vulcanite.

It is best used while the patient is in the lithotomy posture. When it is passed through the anus, light is reflected into it, and it is rotated in order to bring different portions of the wall into relation with the fenestra.

This method is not so satisfactory as the last two described.

Bladder.—(*a.*) In many cases some information may be gained regarding the state of the interior of the bladder by the ordinary *abdomino-vaginal bi-manual* examination, just described.

(*b.*) *Digital examination.*—Vesical, abdomino-vesical, and abdomino-vesico-vaginal.—The patient is chloroformed in the lithotomy posture. The external genitals are thoroughly washed and made aseptic. The urethra should be gradually dilated until the index finger can be passed. For this purpose Hegar's dilators are valuable. The finger should be lubricated with antiseptic vaseline. In this way the state of the mucous membrane may be investigated—*e.g.*, with regard to inflammation, tumours, deposits of salts, fistulæ, presence of calculi. When the bi-manual is performed it should be noted that the body of the uterus may be easily palpated, obscure conditions in front of the uterus, and the state of the Fallopian tubes made out.

After the examination the bladder should be washed out with an antiseptic lotion.

Some recommend cocaine application to the urethra preliminary to dilatation instead of a general anæsthetic.

It is best, in the adult, not to dilate the urethra beyond $\frac{3}{4}$ to 1 inch in diameter. Beyond this there is danger of permanent incontinence. In young women of fifteen to twenty years of age the limit should be $\frac{3}{4}$-inch; in girls of ten to fifteen years it should be from $\frac{1}{2}$ to $\frac{11}{10}$ inch. Of course, greater dilatation has been made, but there is always risk.

(*c.*) *Ordinary specular examination.*—An ordinary small tubular speculum with a reflecting inner surface may be used for the examination of the bladder, the patient being placed in the lithotomy position. Antiseptic precautions are used and the urethra is dilated sufficiently to admit the speculum. Light is reflected into the instrument. This is an unsatisfactory method. The urine trickles into the end of the speculum and the bladder walls fall over it, so that it is difficult to examine the mucosa systematically and thoroughly. The walls of the urethra may be studied by means of a tubular speculum fenestrated on one side, as recommended by Skene.

(*d.*) *Kelly's specular method.*—This is a most valuable method. The patient's bladder is thoroughly emptied. She is placed in the lithotomy position, and the urethra dilated to the size necessary for the speculum required. The hips of the patient are now elevated on cushions, from 12 to 16 inches above the table. A tubular speculum of polished metal containing an obturator is now passed. When the obturator is removed the bladder fills with air,

and balloons. Any fluid still in the bladder can be sucked out with a syringe or with balls of cotton-wool. Light is reflected into the speculum by a mirror placed on the physician's forehead, from an electric lamp, an Argand burner, an ordinary lamp or candle, the room being darkened. Strong sunlight may also be used. By moving the speculum the posterior wall and base of the bladder may be studied. The surface, normally, is pale, the network of vessels being distinct. The inter-ureteric ligament shows by a slightly raised transverse fold. The ureteric orifice varies in appearance. Normally, it is seen as a dimple, pit, or a fine slit, sometimes as a truncated cone with gently sloping sides. The mucosa around the ureters is more pink in colour than elsewhere. In inflammatory conditions the ureteric openings appear as round holes in cushioned prominences, or "as a Λ with the point directed outwards." Often, the fluid may be seen to escape from the ureters in little jets.

In connection with this method the ureters themselves may be examined. They may be sounded by means of a long, delicate instrument, the searcher, and they may be catheterised. This method of removing urine from the ureters is valuable in relation to the comparison of the kidneys in disease. The catheter is left in the ureter for a few minutes, or for an hour or more, and the urine collected. The other ureter is during this time discharging into the bladder, and its urine can be drawn off with an ordinary catheter.

The specula numbered from 8 to 16 will satisfy the requirements for most ordinary cases. No. 10 or No. 12 will suffice for inspecting the bladder, and for passing a

catheter into the ureter. These numbers can be used without anæsthesia. If No. 14 or a larger size be used an anæsthetic will generally be necessary.

The genu-pectoral position may also be used for examination with these instruments. This is necessary in inflammatory cases with thickened walls, where ballooning of the bladder will not occur when the patient is placed in the other position. The ureters are not so easily seen in this fashion. They are concealed by the outer ends of the fold due to the inter-ureteric ligament. Sometimes a satisfactory examination may be made when Sim's position is used, the pelvis being elevated.

(*e*) The bladder may also be examined with a metal *sound* in cases in which stone is suspected, or small phosphatic deposits on the bladder wall. Stones of any size but the very smallest should be made out on bi-manual examination.

(*f*) Sometimes the base of the bladder may be opened into by a mesial cut through the anterior vaginal wall in order that the vesical mucosa may be examined. Such a method is only employed where it is thought that some operative treatment may follow—*e.g.*, the removal of a tumour or where it may be necessary to drain the bladder by the vaginal opening.

(*g*) *Electric cystoscope.*—Leiter's instrument is a metal catheter, ending in a beak bent at an angle (*cathéter coudé*). On the concave or anterior surface of the beak is a rock-crystal window. Within the catheter opposite the window is a small electric lamp. Close to the bend another window is placed on the anterior surface of the long part of the catheter. Inside the tube opposite this window is a

prism, by means of which the rays of light are transmitted along the catheter to the observer's eye.

In the outer part of the instrument an arrangement of lenses causes a magnification of the field of view. The catheter above described is used for the examination of all the surface of the bladder save the base. For the latter a tube must be used with a window on the posterior surface of the beak.

Use of the instrument.—The urethra must be able to admit the catheter (No. 22 French). The bladder must be able to hold from two to four ounces of fluid. If the bladder be too sensitive to fill with the fluid, the preliminary injection of cocaine may be carried out. Rarely is general anæsthesia necessary. If the urine be not clear, the bladder should be washed out first. The fluid used may be weak carbolic or ordinary salt solution. If more than four ounces of fluid be injected, the bladder is distended too much to allow of proper inspection of the walls.

Before the instrument is passed, it should be held under water to see that it works properly. It should be lubricated with glycerine.

Vaginal Specula.

As has already been pointed out, we have a means of examining the walls of the vagina and the vaginal portion of the cervix without the aid of instruments. If a woman be placed in the genu-pectoral position, or in the lithotomy posture with her pelvis elevated, and if the introitus vaginæ be then opened with the fingers, the air balloons the vagina, and by means of a good light we can inspect the cavity thus formed. Had the physics of the abdomen and pelvis been

known centuries ago, the history of the speculum would have been different from what it is. Moreover, had the normal condition of the vagina been known long ago, there would not have been so many imperfect instruments made. It is only recently that the vagina was found out to be a mere slit in the pelvic floor, and not the large cavity figured in the old books. The exact length of the vagina, also, has only been rightly known for a few years. For centuries it was described as being several inches longer than it really is, and the instruments were made accordingly.

The history of the speculum is interesting, but a detailed account scarcely falls within the limits of a practical work. The instrument was used among the Greeks and Romans by Hippocrates, Soranus, Paulus, and others. Specimens may be seen in Pompeii.

In later times it was employed by Ambrose Parè, Paracelsus, and many others. All the ancient forms were valvular or tubular, the latter being either funnel-shaped or cylindrical. The oldest forms were valvular; they possessed two, three, or more blades. For a considerable period before the time of Récamier, the speculum had largely fallen into disuse. This distinguished Frenchman reintroduced the instrument as an aid in diagnosis. His speculum was funnel-shaped, seven inches in length, and made of tin. It is to Marion Sims that we are indebted for the spatular form of speculum, which was introduced by him as a means merely of opening the introitus vaginæ while the patient was in the genu-pectoral position, in order that the air might rush in between the vaginal walls and distend them. Most text-books, at the present time, describe the three chief varieties of speculum—viz., tubular, valvular, and spatular,

giving equal prominence to each. For practical purposes all, except the spatular variety, may be abolished.

Spatular speculum.—The classical instrument is that of Marion Sims. It consists of a handle with a duck-bill blade at each end at right angles to the handle. The blades are of unequal size. It is really a double speculum, and is made of polished metal. In Bozeman's modification of this instrument, the blades join the handle at a somewhat acute angle.

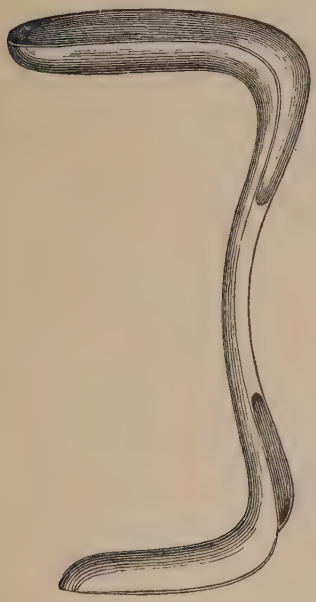


FIG. 2.—Sims' speculum.

Though at first Sims got the idea of this instrument while examining a patient in the genu-pectoral position, he afterwards used the instrument to the same advantage when the patient was placed in the modified genu-pectoral, or, as it is generally called, the Sims' position. For many years the speculum has been used in connection with this posture, both for diagnosis and treatment.

Use of the Sims' speculum. -(*a*) In the Sims' position. The patient is placed semi-prone. She lies on her left side on a couch or table, her left arm hanging over the edge next the physician; she then turns the upper part of the body so

that the breasts touch the table; her knees are drawn up and the right one made to touch the table with its inner surface. It is evident that the transverse diameter of the pelvis is oblique to the table, and that the pelvis is on a higher level than the upper part of the abdomen.

The speculum is now introduced. The blade to be used is warmed and oiled on its convex surface. Hold it by the other blade in the left hand. Pass two fingers of the right hand into the vagina to open it. Introduce the blade between them and push it upwards and backwards towards the hollow of the sacrum, until the end lies in the posterior fornix, the fingers of the right hand being withdrawn. The perineum is now drawn well back, and the upper end of the blade can be manipulated so as to move the cervix backwards or forwards. The opening of the vagina has led to the in-rush of air, ballooning occurs, and the cavity can be examined with a good light. To hold the instrument steady, the left hand should be placed under the handle, its ulnar surface resting on the right buttock, the handle being held between the thumb and fore-finger. By keeping the outer blade on a higher level than the inner, the right labium can be kept up somewhat, so that the entrance to the vagina is made more open.

The inner surface of the labia—the surface of the vagina except the posterior part—and the vaginal portion of the cervix, can now be examined. If necessary, for better admission of light, the labia may be held aside, or a retractor used to pull forward the tissues of the pubic segment.

In this position, by shortening the length of blade in the vagina, the uterus may be pulled down by means of a volsella. A sound may be passed into the uterine cavity,

applications made to it, to the cervix, or to the vaginal wall.

Until recently this position has been largely employed for the performance of several operations on the cervix, anterior vaginal wall, and base of bladder. It will, however, be found that it is most convenient to do almost all of these operations in the lithotomy position. The Sims' position is, therefore, becoming much less frequently employed.

(*b*) In the lithotomy position. The Sims' speculum may be used in this position, but, of course, only as a spatula, not in the same relationship as that which exists in the genu-pectoral or modified genu-pectoral. It may be used advantageously in the lithotomy position, but far more convenient for most purposes is the spatular speculum of Simon.

Simon's set of spatular specula.—By far the most convenient series of specula, both for examination and operation purposes is some such form as that devised by Simon. It consists of two handles, into which may be fitted a set of spatular blades varying in length and width. Some of these are concave, others are almost flat. One handle is used for the posterior wall, the other can be used with a retractor-like blade for the anterior wall. The blades are arranged to suit vaginæ of different sizes. In operative procedures the greatest advantage can be obtained with little trouble. For operations in which we want the introitus kept as wide as possible, and the uterus pulled well down—*e.g.*, in amputation of the cervix—the short broad blade which fits the handle at an acute angle is most advantageous; a long narrow blade in such a case being most unsuitable. Blades may also be obtained with wide lateral flanges which pro-

tect the labia. A hollow anterior blade is used by some in operations for the purpose of irrigating the parts with an antiseptic lotion, a rubber tube from the reservoir being fastened to a tap on the blade.

The Simon instrument is meant to be used in the lithotomy position, and it is evident that besides its great value in operative work, it is most valuable in examination. The combined use of two blades enables the physician to inspect the vaginal portion of the cervix and the vaginal walls. In operating, it is sometimes helpful to use retractors as well, for the purpose of drawing the labia further apart. Ordinary copper retractors suffice for this purpose.

FIG. 3.—Simon's set of spatular specula.

It is also evident that a handle, with one of the concave blades, may be used in place of a Sims' speculum if it be desirable to examine a woman in the genu-pectoral or modified genu-pectoral position. If one be in possession of a set of Simon's specula, it is not necessary to have a special Sims' or a tubular speculum.

Some of the procedures for which this instrument may be used, besides its use in examination, are the following:—Packing the vagina, making applications to the endometrium;

to the cervix, and to the vaginal walls; operations on the vaginal walls, on the base of the bladder, on the cervix; curetting, removal of polypi, ligature of uterine arteries, extirpation of the uterus, colpotomy.

Tubular speculum.—This is made of various materials —*e.g.*, celluloid, metal, wood, glass, vulcanite. The one most commonly employed is the Fergusson speculum. It is a cylindrical tube with one end trumpet-shaped and the other bevelled. Owing to the bevelling one side is longer than the other so as to suit the vaginal walls. Several sizes of this instrument are used.

FIG. 4.—Fergusson's speculum.

This speculum is passed ordinarily when the patient lies in the lateral position, but it may be used in the lithotomy. When it is introduced the cervix should be in the upper end.

Such a speculum is of very little use. Through it the vaginal portion of the cervix only can be seen. No operations can be performed with it save pricking Nabothian follicles. Practically, it is only good for making applications to the vaginal portion of the cervix, and to the lower portion of the cervical canal in certain cases. A sound cannot be passed into the uterine cavity through this speculum without difficulty, and, indeed, it should not be attempted.

I have also used it to advantage in making applications to the vaginal walls, in the following manner:—The speculum is introduced. Through it a pledget of wool, soaked

in the fluid to be applied, is passed up to the cervix by means of a pair of long forceps. The speculum is now gradually withdrawn, the pledget following it. In this way the vaginal walls close on the wool from above downwards, and so get touched by the medicinal fluid.

Unless care be taken, the tubular speculum may give a wrong impression as to the condition of the cervix. When it is in position it may bring the flaps of a split cervix together so as to hide the lesion. The ordinary long instrument, by being pushed well up into the fornix, may give a false impression as to the length of the cervix; it may cause it to be apparently elongated.

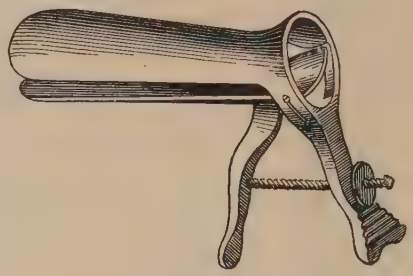


FIG. 5.—Cusco's speculum.

Valvular speculum. — Of this form there are many varieties. Perhaps the best known is Cusco's bivalve speculum. Neugebauer's and Barnes' instruments are also described in the books.

The Cusco speculum is introduced into the vagina with the blades closed. In position, they should lie against the anterior and posterior walls. By means of the attachments at the outer ends of the handles the inner ends of the blades can be separated.

The Neugebauer and Barnes' instruments are introduced in the same manner. The posterior blade is passed, and then the anterior, the latter sliding along the former.

These valvular specula are of no greater value than the tubular forms. Indeed, the gynecological specialist never uses them. The cervix may be examined by means of them, but they are of no use for operative procedures. It is important to note that they may give an entirely erroneous impression of the cervix in certain states—*e.g.*, if a cervix be lacerated, the valvular speculum when opened, by separating the flaps and causing the red mucosa of the canal to appear, may lead the physician to think that marked endocervicitis, with the formation of a catarrhal patch, exists. In the olden days it would probably have been diagnosed as an ulceration.

Finally, in all cases, before a speculum be used, the bi-manual examination should be made. For mere purposes of diagnosis, owing to the importance of this latter method, the gynecologist rarely now-a-days requires to use any speculum. It is only in certain cases that it is of benefit. Its great value is in operative procedure. As an aid in diagnosis it is generally found that the instrument is most used by the practitioner who has had little experience in the special diseases of women.

The Volsella.

This instrument is used for grasping tissues during operations, or in examinations. It is simply a pair of forceps. For holding the cervix an instrument eight or nine inches in length may be used. It may be straight or curved; the latter form is more easily kept out of the way of the physician when the anterior lip of the cervix is held during an operation. The blades should have a separable joint, as indeed should all forceps, in order that the

instrument may be kept easily aseptic. Near the handle there should be a catch by which the blades can be held together when they are closed. The simplest and best form is that which is found on the well-known Pean artery forceps; it can be opened and closed without the use of two hands. The grasping teeth at the ends of the blades are two, three, or four in number, and vary in size. This instrument may be used, also, to hold tumours, to grasp the vaginal walls or external genitals in operative procedures. For most vaginal and perineal operations, however, artery forceps may be used to hold up the tissues. The most suitable form is that devised by Kocher; at its end is a sharp tooth by which the tissues are firmly held.

FIG. 6.—Volsella.

Ordinary bullet-forceps can also be used for the same purposes.

A special uterine volsella may also be used for certain cases of vaginal extirpation of the uterus or for colpotomy. One blade longer than the other ends like a uterine sound; it is meant to be passed into the uterus. The other blade is like that of an ordinary volsella, and fastens into the outer surface of the

cervix. This instrument gives a firm grip of the uterus, and the inner blade keeps it stiff, so that it can be better palpated and manipulated during the operation.

With the volsella the uterus, in normal conditions, can be pulled downwards almost as far as the introitus vaginæ. In many pathological conditions—*e.g.*, cellulitis and peritonitis—this is impossible. As it is pulled down it tends to become straightened and to lie in the long axis of the vagina. The vaginal walls become inverted, and the bladder and ampulla of the rectum somewhat drawn down.

The cervix may be seized by the volsella without or with the use of the speculum. Generally the anterior lip is caught, but the other may be held if it be necessary.

(*a*) *Without the use of the speculum.*—The patient may lie in the lateral or lithotomy position. The two first fingers of the right hand are passed until the cervix be touched. The volsella, held by the left hand, is passed along these fingers and the anterior lip grasped and pulled down.

(*b*) *With the speculum.*—When the vagina is opened either in the Sims, the genu-pectoral, or the lithotomy posture, it is a simple matter to pass the speculum and grasp the cervix.

The following are the uses of the speculum :—

(*a*) In diagnosing the extent of a cervical laceration, and judging the presence or extent of a catarrhal patch. Each flap is grasped with a volsella, and they are approximated and separated. If, when the lips are brought together, the red patch does not disappear, an endocervicitis is present, and is extending downwards on to the vaginal portion of the cervix.

(*b*) In diagnosing the relation of the uterus to large tumours which occupy the abdominal cavity. An assistant holds the tumour, and the physician pulls on the cervix by means of a volsella, or the latter may merely steady the instrument while the assistant pulls upward on the tumour. If the tumour be adherent to the uterus, or grow from it, they will move together during the examination, save when the adhesions are very long, or the tumour has a long pedicle. Of course where the tumour or the uterus be fixed to other structures their movements may be interfered with, and we may gain little information from the use of the volsella.

(*c*) In performing the rectal examination, we may often be greatly helped by drawing down the cervix with a volsella. The examining finger can more readily palpate—uterus, tubes, ovaries, and broad ligaments.

(*d*) The chief use of the instrument is in operations on the genital tract, wherever it is desired to hold a piece of tissue steadily or to make traction on it—*e.g.*, in curetting, amputation of the cervix, &c.

The volsella should not be used to pull down the cervix in acute peritonitis or cellulitis, in pyo-, hæmato-, or hydro-salpinx, in tubal gestation, in hæmatocele or hæmatoma, or in advanced cancer of the cervix.

A simple tenaculum is recommended by some for the purpose of steadying the cervix. It is not so serviceable as a volsella. Such an instrument is practically only of service in vesico-vaginal fistula operations.

The Uterine Sound.

In ancient times a sound was used in examining the genital tract, but it is highly probable that it was limited to

the vagina. Mention is made of the instrument by Paulus Ægineta and Soranus. For a long time its use was forgotten, until it was reintroduced by Levret. It is, however, to Sir James Y. Simpson that we owe the wide use to which the sound has been put in gynecological practice during the last fifty years. There is no doubt that the sound has been far too extensively used. In the pre-antiseptic days it was often a source of infection. But its employment in diagnosis has, during recent years, been very largely diminished, as a result of the perfected methods of examining patients by the hands alone. In the consulting-room the sound need be used but rarely.

Many sounds have been made by gynecologists, but only one or two need be described. Any flexible metal rod, with a knob-pointed end, will serve as a sound. One of the best known and most serviceable is Sir J. Y. Simpson's sound. A. R. Simpson's sound is a modification of it, and was introduced for a special purpose. Sir J. Y. Simpson's sound is about 12 inches long, and made of nickel-plated copper. It can be moulded to any desired shape, yet it is not too soft. The handle has a rough and a smooth surface, the rough being on the side towards which the point of the sound looks. When the sound is in utero, we thus always know the direction of the point.

The end of the sound is rounded and blunt. Two and a-half inches from the end is a round knob, and at every inch beyond this there is a mark. On the old forms of this sound there was a notch $1\frac{1}{2}$ inches from the point; this is a source of weakness, and is unnecessary.

Points to be observed before passing the sound.—It should not be passed during menstruation, nor during an

acute attack of inflammation in the peritoneum, cellular tissue, or internal genitals, nor in a case of uterine cancer, except when there is some special reason for its use. Above all, care should be taken that the woman is not pregnant. If she has missed a period, the sound should not be passed unless it be certain that there is no ovum in the uterus.

A careful bi-manual examination should always be made before the sound is used. The physician should gain a good idea as to the position and shape of the uterus, and should curve the instrument accordingly.

Method of using the sound.—The sound may be passed when the patient is in the Sims, in the lateral, or in the lithotomy position. If she be in the Sims posture, the cervix should be pulled down with a volsella before the instrument is introduced.

The lithotomy position may be used if the patient be anæsthetised. In ordinary practice the left lateral position is satisfactory.

After the bi-manual has been performed, the patient turns on her left side, and draws up her knees. The sound is rendered thoroughly aseptic, and its point is dipped in antiseptic vaseline. The first two fingers (or the index only) of the right hand are introduced into the vagina so that the tips touch the cervix, the palmar surface turned towards the sacrum. The left hand holds the handle of the sound lightly, so that its rough surface is directed towards the back, and guides the point along the palmar aspect of the vaginal fingers until it enters the os uteri.

In cases where the uterus lies to the front, the end of the sound is gently guided into the cervical canal for about half

an inch. The handle of the instrument is next carried by a long sweep until it lies under the symphysis, its rough side directed towards the front. The handle is next simply moved backwards towards the perineum. By the latter manœuvre the point of the sound moves forward to the fundus of the uterus.

If the uterus be retroverted the method is simpler. No long rotation of the handle is necessary. After the point of the sound has entered the cervical canal, the handle of the

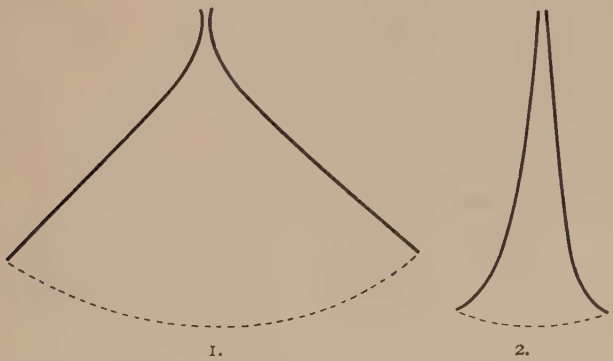


FIG. 7.—Diagrams showing right and wrong methods of rotating the sound. 1. Right method, long rotation of handle. 2. Wrong method. (After HART and BARBOUR.)

sound is moved directly forwards towards the symphysis. In this way the point of the instrument moves backwards to the fundus uteri.

When the patient is in the lithotomy position, the sound is passed directly, being held according to the position of the uterus. Thus, if the uterus lie to the front, the handle is held at first in the middle line opposite the symphysis, and

then moved backwards ; at the same time the point of the sound moves directly to the fundus.

In all cases no force is to be used. The sound should glide into the uterus. In normal cases no pain should be caused, though often the patient has an unpleasant feeling. In nervous women, or in cases in which the canal is very narrow, there may be a feeling of colic or of sickness. No bleeding should be caused by the passage in normal conditions.

Difficulties in passing the sound.—The point may catch in a fold of the *arbor vitæ* of the cervical mucosa. It should not be forced through the obstruction, but should be withdrawn somewhat, and passed along again until it slides by the fold. Owing to marked displacement of the uterus, it may be impossible to get the sound into the os ; in such a case it may be necessary to pull down the cervix with a volsella. In cases of marked anteflexion or retroflexion it may be impossible to pass the sound round the bend ; by pulling down the cervix or pushing up the fundus with the vaginal fingers (or with a finger in the rectum if the uterus be retroflexed), the difficulty may be overcome. If there be stenosis either of the external or of the internal os, it may not be possible to pass the instrument. If the uterine cavity be tortuous owing to the bulging of a tumour of its wall or to the presence of polypi, it may be impossible to guide the sound through the whole length of the canal. For these last-mentioned cases a soft bougie or catheter is recommended by some ; one may be deceived in their use, however, because they may curl up in the cavity, and give one a false idea as to the length of the canal. When there is atresia of the uterine cavity, of course the sound cannot

be passed. There are different conditions in the vagina also which make it impossible to sound the uterus—*e.g.*, narrowing, the presence of large polypi in it, &c.

Use of the Sound.

(*A*) *In Diagnosis.*

1. To ascertain the length of the uterine cavity. In ordinary practice this is the chief use to which the sound is put.

2. To determine the thickness of the walls of the uterus. This rarely is done. For the posterior wall, a finger is introduced into the rectum; for the anterior, it is passed into the anterior fornix, into the bladder, or against the abdominal wall.

3. To estimate the degree of patency of the uterine canal. This has special reference to the cervical portion. In the great majority of cases it is only the os externum, or the os internum to which attention is paid. Atresia or stenosis may be diagnosed.

4. To ascertain the presence of tenderness in the walls of the uterus, and to detect irregularities or tumours of the inner surface. In several diseased conditions bleeding may be caused.

5. To determine the direction of the uterine axis, and the relation of the body to the cervix, in cases where this is impossible by means of the bi-manual examination. In the great majority of cases the bi-manual alone is sufficient for the determination of the position and flexion of the uterus. But in certain cases—*e.g.*, in tumours of the uterine wall, in large, bloody, or inflammatory exudations around the uterus; in cases of small exudations, cellulitic, or peritonitic; in

irregular or multiple tumours of various kinds in close relationship to the uterus the bi-manual may not be able to distinguish the fundus uteri.

The sound must be passed most carefully. While it is in position, the bi-manual is performed, the instrument being held by the vaginal hand. The abdominal hand may feel the fundus uteri pushed upwards by the end of the sound. It is for such an examination that the A. R. Simpson sound is more useful than the Sir J. Y. Simpson instrument. Owing to the length of the latter it is not easily held by the vaginal hand. The shorter A. R. Simpson sound when passed rests by its handle on the hand, where it is held by the ring and little fingers against the hypo-thenar eminence.

In cases of flaccid uterus it is valuable to do the bi-manual while the sound is *in utero*.

6. To determine the mobility of the uterus in certain cases. The sound is rarely required for this purpose. When it is desired to make out the relation of a large tumour to the uterus, the sound may be passed and its movements noted while the tumour is moved by the other hand, or by an assistant. It is never justifiable to attempt to move the uterus in order to determine the effect on the tumour. Nor is it right, in a case where there is no tumour, to move the uterus about by means of the sound. Mobility of the uterus should be determined by the bi-manual examination.

(*B*) *In Treatment.*

1. To replace a retroverted or retroflexed uterus.

2. To dilate a stenosed uterine canal. For this purpose it is generally used along with special dilators.

3. To apply fluids to the uterine mucosa; for this purpose its end is covered with wool (*vide* p. 79).

Dangers in the use of the sound.—The great danger is that connected with the introduction of septic organisms, as a result of which general blood-poisoning may follow, or local pelvic inflammation of various forms. The uterine wall may be perforated when it is thin as in superinvolution, or when it is soft as after an abortion. Cases have been described where this accident has been unattended with serious results. Severe hæmorrhage may be caused sometimes—*e.g.*, when the mucosa is in a condition of hæmorrhagic endometritis, or in new growth formation in the mucosa. Another great risk is the passage of the sound in cases where the physician has failed to exclude the existence of pregnancy. The greatest caution should be exercised.

Dilators.

Dilatation of the genital tract.—Dilatation is employed both for purposes of examination and of treatment.

(*a*) *Vagina.*—For purposes of examination it may sometimes be necessary to dilate the introitus or the canal itself. The following means are used :—

1. Continued plugging of the vagina.
2. Gradual dilatation with Barnes' bags.
3. The introduction of different sizes of hard rubber or glass tubes.
4. The insertion of round or oval dilators—*e.g.*, Bozeman's.

The dilatation may be continued for one, two or more days, according to the nature of the case, and the examination should be made as soon as the dilatation is completed.

In the treatment of such conditions as stenosis of the vagina, or atresia, which has been opened, or in cases where more room is needed for operations on the vaginal walls, base of bladder or uterus, the canal may be dilated by one or other of these methods. In addition, however, the two following plans must be kept in mind :—

5. Dilatation with the hand under chloroform, the fingers being arranged as a cone. This method is used in certain forms of dyspareunia, and to gain more room in operations on the upper genital tract.

6. Incision of the perineum. This may sometimes be necessary in operations—*e.g.*, the removal of an intra-uterine polypus in a nullipara. The incision should be made on each side, a short distance from the middle of the anterior margin of the perineum. The cut should extend as deeply as is necessary in a backward and outward direction. Bleeding points must be tied, and antiseptic precautions observed. At the end of the operation the wounds are closed with catgut suture.

(*b*) *Uterine Canal.*—The uterine canal may require to be dilated both for purposes of diagnosis and of treatment—*e.g.*, where a polypus, malignant disease, or remains of placenta and membranes may be suspected to exist in the uterine cavity, in stenosis of the canal, to allow passage of curette, or application of medicaments to the mucosa, &c.

The following methods may be employed :—

1. *By the use of a series of graduated dilators.*—Hegar's instruments are very suitable. In a complete set there are thirty, measuring in diameter from $\frac{1}{12}$ to $1\frac{1}{12}$ in. There length should be 6 or 7 inches. They are made of vul-

canite or metal. The smallest sizes are apt to break when made of the former material.

Method of use.—It is generally most convenient to anæsthetise the patient who is placed in the lithotomy position.

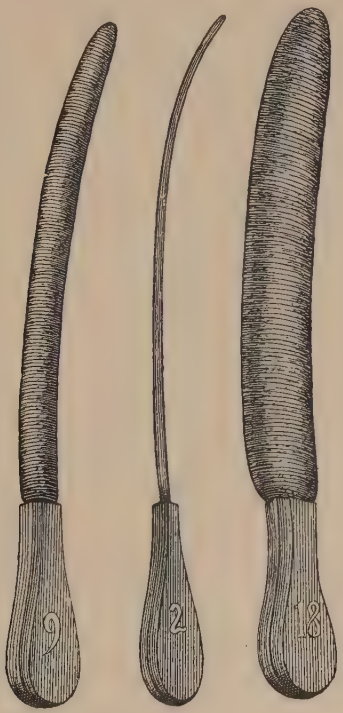


FIG. 8.—Hegar's dilators.

The vagina is made thoroughly aseptic. The dilatation is carried out with thorough antiseptic precautions. The position and relations are made out by means of the bi-

manual. The cervix is drawn down and held steady by means of a volsella or two. The size and direction of the canal is estimated with a sound, and the dilators, dipped in antiseptic oil or vaseline, are passed in succession until the necessary degree of dilatation is reached.

There may be difficulty owing to a marked flexion of the uterus. In such a case a finger placed in the anterior or posterior fornix, or in the rectum, may help to straighten the uterus while the dilators are being passed. Or special metallic curved bougies may be used. In extreme rigidity of the wall there may be difficulty in introducing the dilators. In such a case it is often advisable to use a metal instrument like that of Sims or Ellinger, along with the Hegar dilators.

In very many cases the wall of the uterus is not torn when dilatation is complete, but sometimes it is, especially at the internal or external os.

After dilatation is completed, and the examination finished, the canal is washed out with an antiseptic. If an operation be performed various procedures may be adopted (*vide* various operations).

In certain conditions of the uterus the finger may be introduced into the uterus without preliminary dilatation—viz., after an abortion or full-time labour; or after a polypus has passed through the cervical canal.

2. *By the use of steel dilators with separable blades.*—Sims' and Ellinger's instruments are very serviceable if made of good metal. The former has three blades, the latter two.

Method of use.—Patient is arranged as before described. The dilator is passed, with closed blades, through the

cervical canal, and then either the screw at the end of the handles is turned, whereby the blades separate slowly and dilate the cervix, or the hands may press the handles together, whereby more forcible dilatation is caused. If the dilator will not enter the canal it is necessary to pass several small Hegar bougies in order to enlarge the passage sufficiently. It is best not to attempt great dilatation with this instrument. It should only be used for moderate degrees.

FIG. 9.—Sims' dilator.

3. *Enlargement of the cervical canal* may sometimes require to be brought about by means of cutting operations. (These will be described later. *Vide* p. 203.)

4. *By the use of Tents.*—Formerly tents were largely employed in gynecological practice. Now they are but rarely required. Three varieties are employed—viz., sponge, tangle, and tupelo tents.

Sponge-tent.—The sponge-tent is an elongated cone-shaped piece of dried, compressed sponge, impregnated with an antiseptic. When introduced into the uterus it stimulates the mucosa to secrete, and the fluid soaking into the sponge causes it to expand, and so to dilate the canal. Before it is used it may be immersed in a concentrated alcoholic solution of carbolic acid, or

in a saturated solution of iodoform in ether, with a little alcohol. Then it may be rapidly scrubbed in 1 in 500 corrosive solution. Each one is provided with a string

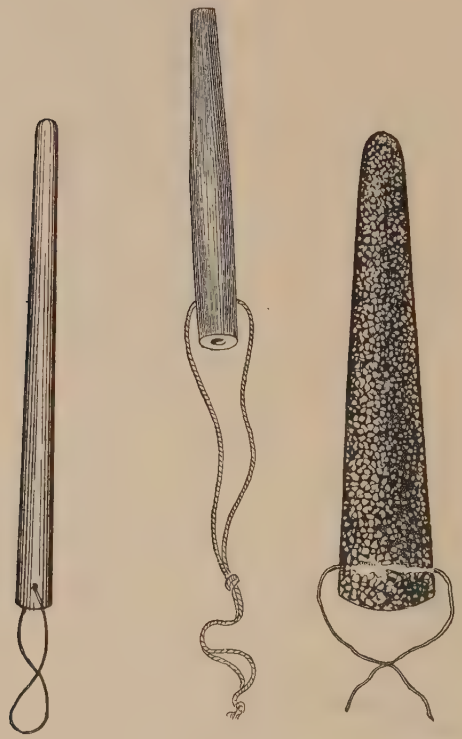


FIG. 10.—Tents.

1. Tangle. 2. Tupelo. 3. Sponge.

by means of which it may be pulled out of the cervix after use.

Method of use.—The patient is placed in the lateral, in the Sims', or in the lithotomy posture, and the genital tract thoroughly cleansed with an antiseptic lotion. A speculum can be used to expose the cervix, which is pulled down with a volsella. The tent is then passed into the cervical canal by means of the fingers or a pair of curved dressing-forceps (special tent-introducers are not necessary).

In some cases no speculum need be used. In other cases where one lacks assistance, the tent may be introduced while one hand steadies the fundus through the abdominal wall.

When the tent is in position the base of the tent should remain outside the os externum. It should be held in the cervix for a little. If it shows no tendency to slip out, no vaginal plug is necessary. If it tends to move an antiseptic tampon should be introduced. The tent should not be left in the cervix longer than twelve hours. During the process of dilatation an occasional antiseptic douche should be given. On its removal an antiseptic douche should be given. If necessary another larger tent can be introduced. The tent is removed by gentle oscillatory traction on the string. Care should be taken that no piece is torn off and left behind in the uterus.

Tangle-tent.—This is made of the stem of the sea-tangle (*laminaria digitata*). It may be solid or perforated. The latter expands more rapidly than the solid form, but is not so effective. This tent may be impregnated with an antiseptic, because after soaking it will, if dried, get smaller again, though it may somewhat lose its rounded shape. It can, however, be smoothed off. Before its introduction it can be softened in a hot antiseptic, and bent to the curve

of the uterine canal. If placed in a cold lotion for a little it retains this form. If necessary several small tents bound together by a rubber band, may be introduced into the cervix instead of a single one. Tangle dilates least rapidly of the three forms.

It is introduced in the manner described for the sponge-tent. It tends to slip out unless kept in position by a vaginal tampon.

Tupelo-tent.—This is made of the root of the *nyssa aquatalis*. It cannot be soaked with an antiseptic, because if once expanded it will not return to its original size. It dilates rapidly when in position, but not to such a marked degree as the sponge-tent.

Dangers connected with the use of tents.—All tents are dangerous because of the risk of introducing septic material. The most dangerous is the sponge-tent, because it tends most of all to injure the mucous membrane, and to produce a profuse secretion which may collect and decompose; it is difficult to cleanse it thoroughly; a part of it may be torn off and left in the uterus, when its removal is difficult owing to the contraction of the uterus on it. Tangle and tupelo-tents are much safer.

Points to be observed with regard to their use.—If possible pass the tent only once. Do not introduce more than two in succession. The patient must remain in bed during and after their use. They must be introduced under strict antiseptic precautions. While in position the vagina should be douched every three or four hours. Tents are not to be used in acute inflammation in the pelvis, nor in blood extravasations, nor in cancer of the cervix, nor where distended Fallopian tubes are present.

The Curette.

This instrument was first employed by Récamier in 1846. It is used in scraping the endometrium for diagnostic purposes (*i.e.*, for the examination of the tissue removed), and also for treatment.

Various forms of curette are in use. The following need only be described:—Roux', Simon's, and Récamier's. Roux' has an elongated hollowed-out portion, with sharp edges at each end of a handle, one of which is larger than the other; it is made of steel. The ends should be rounded, not pointed. This form is used by Martin of Berlin.

Simon's curette has a round, spoon-shaped end, with sharp edges.

Récamier's instrument has a loop-end, one edge of which is sharpened.

Dull wire curettes have been used, but they are quite unnecessary. Perforated spoon curettes are used by some; they allow a stream of antiseptic lotion to irrigate the uterine cavity during the curetting.

Method of using the curette.—The patient, with empty bladder and rectum, is placed in the lithotomy position (some use the Sims' position). A careful bi-manual is performed. The vulva and vagina are thoroughly cleansed. Anæsthesia is advisable, though without it the operation may sometimes be performed without causing pain.

A short-bladed spatular speculum is introduced posteriorly, and held by an assistant. The cervix is drawn down by a volsella placed in the anterior lip; the handle is held by the assistant over the symphysis. A sound is next passed

1.

2.

3.

FIG. 11.—Curettes.

1. Roux' (often named Martin's).
2. Simon's.
3. Loop of Récamier's.

to estimate the size and direction of the uterine cavity. If the cervical canal is large enough to admit the curette quite easily, no dilatation is necessary. If it be not, Hegar's dilators or an expanding dilator may be used. The cavity is next washed out by means of a double catheter. Then the curette is introduced as far as the fundus. If the whole endometrium is to be scraped, the operation should be done in a systematic fashion—*i.e.*, the anterior wall should first be attended to, then the posterior, then the fundus, and, finally, the lateral borders.

Unless such a methodical process be adopted, some parts of the mucosa are apt to be left untouched.

In scraping, the forefinger of the left hand should be placed in the fornices against the uterus, and it should be moved about so that the instrument always works against it.

When a scraping is to be made for examination, only the part desired need be removed. If there be endocervicitis around the os externum, the diseased part may also be scraped off. In many cases, as the curette touches the muscular wall, a grating sound is made. The same sound is produced if dense new growths are present; also when the curette scrapes the folds of the cervical mucosa in certain cases of hyperplastic endocervicitis.

All debris is now washed out of the uterus and vagina with a hot antiseptic lotion. Iodised phenol or some other styptic is generally applied to the rawed surface, an antiseptic tampon is placed in the vagina, and the patient is put to bed. In cases where the uterus is soft or hæmorrhage is feared, an antiseptic tampon may be placed in the uterus.

After-treatment.—The vaginal tampon is removed on the day following the operation, and an antiseptic douche given. This is continued twice a day for a week; thereafter once daily as long as may be required. The patient may get out of bed at the end of eight or nine days, save after abortions, and in cases where it may be necessary for other reasons to keep her at rest. She must only gradually return to her duties.

Conditions in which the curette is employed.—In inflammatory conditions of the uterine mucosa; in incomplete abortion; in adenoma, sarcoma, and carcinoma of the mucosa; in conditions of the mucosa whose diagnosis is uncertain.

In the great majority of cases Roux' curette will be found to be the most serviceable.

In abortion cases, or in sarcoma or adenoma cases, where large masses are to be removed quickly, a large Simon curette is, perhaps, the most convenient.

Contra-indications and dangers.—Pregnancy, acute inflammatory conditions in the pelvis, distended Fallopian tubes. Formerly chronic inflammation in the pelvis was mentioned as a contra-indication, but this belief must be abandoned. Curetting is not risky in these cases if thorough antisepsis be carried out. Moreover, the curetting may benefit the chronic condition by removing what is so often an area of germ infection—viz., the diseased mucosa of the uterus. In regard to acute inflammations, it must be noted that if they occur in the puerperium, they may be related to diseased conditions in the interior of the uterus, and in certain of these cases it is recognised that curetting is not only justifiable, but absolutely necessary.

The dangers of curetting are the introduction of septic infection, perforation of the uterus, causation of hæmorrhage.

Antisepsis must be thoroughly carried out. The instrument should be handled carefully. Perforation is most apt to occur when the uterine wall is soft, as after an abortion, or as a result of the infiltration of a rapidly growing sarcoma, or when it is abnormally thin.

In the majority of cases there is little loss of blood during or after curetting. It may be considerable, however, in hæmorrhagic or fungous endometritis, in incomplete abortion, or in malignant disease. For such cases the uterine tampon of iodoform gauze for a day or two is most valuable.

The Aspirator.

In gynecological practice the aspirator is employed both for purposes of diagnosis and of treatment. Its main use is for the latter.

1. In the examination of women, in the majority of cases, we are able as a result of the clinical history, and of careful physical examination (especially under an anæsthetic), to ascertain the presence of fluid, and to have a fairly correct idea as to its nature. Still there are certain conditions in which, owing to our uncertainty regarding these points, we may desire to employ the aspiratory needle.

The swelling may be punctured through the vagina or through the body wall. The instrument must be used under the most careful antiseptic precautions. In some cases an ordinary hypodermic needle may suffice. In other cases a small aspirator with a long needle is required.

The larger aspirators used in treatment are not necessary for the exploratory puncture.

2. Various forms of aspirator are used in treatment. These will be described in connection with the operations in which they are used.

PART II.—MINOR THERAPEUTIC MEASURES.

MINOR THERAPEUTIC MEASURES.

The Vaginal Douche.

This valuable therapeutic agency has been employed for centuries. In the time of Hippocrates it was employed merely to apply certain medicaments to the vaginal walls.

It was first employed for the purpose for which it is mainly used now-a-days in the fifteenth century.

Nature of apparatus.—The best form of douche apparatus is one which allows of the flow of a continuous stream of water, under the influence of gravity. The ordinary douche-can, with rubber-tube attached, is the most convenient instrument. According to the elevation of the can above the patient, the force of the stream varies. The can may be obtained in various sizes. The tube is furnished with a stop-cock, and should have at its end a vaginal nozzle, five or six inches long, with lateral perforations near the distal end. This nozzle may be straight or curved, and should be made of vulcanite, though glass is largely employed. Instead of the douche, a tube may be used with an ordinary pitcher, the flow being obtained by syphon action.

A less convenient instrument is the largely used rubber-syringe worked by means of a bulb. This allows only of an intermittent stream, it is apt to fatigue the hand of the person who works the bulb, and is liable to get out of order.

Method of use.—The douche may be taken by the patient herself, or may be given by a nurse or other person. The most thorough method is to place the patient in the dorsal position with a large bed-pan under her hips. The can, filled with the necessary lotion, is placed at a suitable distance above the patient, on a shelf, hung on a nail, or held by some one; the stream is started and the nozzle, thoroughly clean, is passed into the vagina as far as the cervix; the water, which escapes from the vagina enters the bed-pan.

If the patient has no assistance it is usual for her to use the douche sitting astride of a vessel. This position is not so satisfactory, the fluid escaping too rapidly from the vagina.

The lithotomy position is a convenient one, but is rarely necessary.

When the douche is used there must be room enough for a good return outflow; otherwise there is danger of fluid being forced into the uterus and Fallopian tubes. Where the vagina is not roomy, a large double catheter, like that of Budin, may be used.

The patient should lie at rest for fifteen minutes or more after the douche.

Indication for use.—To remove secretions from the vagina, during the healing of wounds—*e.g.*, after operations on the cervix or vaginal walls; to apply astringent, antiseptic, and anodyne agents; to get the benefit of the thermal property of the stream.

Nature of fluids used.—In cases where the influence of heat is not wanted, the fluid need only be warm. When the hot douche is to be taken the temperature of the fluid should be somewhere between 100° and 120° F.; it is best

that the patient should begin with the lower temperature and gradually increase it. Ordinarily the patient is told to use water as hot as the hand will bear. Cold douches need not be employed.

Various medicaments are used in certain cases, according to the nature of the disease, *e.g.*, alum (ʒi. to Oi.), copper sulphate (ʒss. to Oi.), zinc sulphate (ʒss. to Oi.), corrosive sublimate (1 in 3000 to 8000), carbolic acid (1 in 30 to 60), permanganate of potash, thymol, hydronaphthol, boric acid, &c.

When along with the influence of the hot douche, the benefit of an astringent or antiseptic lotion is required, it is best that the patient should first use pure hot water, and immediately afterwards the medicated fluid.

Frequency of employment.—In the ordinary run of cases the patient is ordered to use the douche both in the morning and evening, or only at one of these times. In special cases it may be necessary to order it to be used more frequently.

It is important in inflammatory cases that the douche should not be of too short duration. Where the contraction of blood vessels, the relief of congestion, or the promotion of absorption is desired from two quarts to two or three gallons should be used on each occasion. A considerable quantity should be used when an antiseptic is employed. When a cleansing or astringent action is desired a couple of pints of fluid usually suffice.

When a patient is to use the douche on account of its thermic effects for some weeks, she should only gradually work up to the larger quantities.

Dangers.—In the great majority the use of the douche is not associated with any unpleasant effects. The danger of

fluid being forced into the uterus has already been alluded to. Care must be taken to ensure a return outflow from the vagina.

In acute inflammatory affections, especially of ovaries, bladder, or rectum, the douche must be used cautiously. Pelvic pain may be increased or colicky pain started, faintness or marked perspiration is sometimes brought about. When new growths are present care must be taken not to damage the tumour wall and cause hæmorrhage.

The Vaginal Plug.

The introduction of a plug into the vagina may be employed for various reasons.

1. To check hæmorrhage—*e.g.*, from the uterine cavity in various conditions.

In such a case the most convenient material to employ is iodoform gauze. In introducing it the patient should be placed in either the Sims or lithotomy position, a speculum should be passed, and the gauze firmly packed in the vagina from above downwards, the fingers being used for the purpose. If the vagina be long or narrow, dressing forceps may be required.

If an astringent—*e.g.*, a solution of alum or glycerine of tannic acid—be used, along with the plug, the vaginal walls contract more firmly, and the pressure of the plug is thereby increased. Packing may be more easily introduced and removed if the vaginal walls be smeared with an antiseptic vaseline. An antiseptic plug may be left *in situ* for one, two, or three days.

If there be retention of urine during this time, the urine should be drawn off. If there be much pain, either an

anodyne should be given or the lower end of the plug withdrawn.

If another plug is to follow it is well to give the patient a vaginal antiseptic douche before it is introduced.

2. To keep tents in the uterus, iodoform gauze or a ball of antiseptic wool may be used. The plug need not be large. If the wool be used, a piece of string must be tied around it to aid in its extraction.

3. To act as a pessary (*vide* p. 96).

4. To absorb secretions after an operation has been performed—*e.g.*, after an amputation of the cervix. An iodoform gauze plug should be placed against the wound, and left there for 12 or 18 hours; afterwards the vaginal douche is used.

5. To introduce certain medicinal agents.

For a considerable period the value of glycerine plugs in the treatment of chronic pelvic inflammation has been recognised. They were introduced by Marion Sims.

To prepare a plug for use, take a piece of antiseptic absorbent cotton wool, four or five inches square, and half-an-inch thick, pour on its centre about half-an-ounce of glycerine; fold in the corners, and compress the mass until it is saturated, and then tie a piece of string around it. If necessary, two or more may be tied in series on one piece of string.

To introduce the plug, the patient is placed in the Sims or lithotomy position, and a speculum passed. The plug is then pushed well up into the fornix vaginæ.

It may be left in position for 12 to 24 hours. It causes a transudation of serum into the vagina from surrounding parts, which is the chief value in the treatment of inflammations.

So profuse is the discharge sometimes, that the patient may not be able to walk about without discomfort. In the continued use of plugs they may be introduced two or three times a week.

In these inflammatory conditions a solution of ichthyol in glycerine, instead of pure glycerine, may be used. Or the following mixture in certain cases:—glycerinum boracis, 1 part; alum, 1 part; pure glycerine, 14 parts.

Other Methods of Medicating the Vagina.

1. *Swabbing the walls.*—Sometimes it is desired to apply some medicament to the vaginal walls, with the use of douche or plugs—*e.g.*, in granular vaginitis.

The patient is placed in the Sims or lithotomy posture, the cavity exposed with spatular specula and the walls touched by a swab of wool soaked in the medicament.

A Fergusson speculum can be used conveniently for this purpose. It is passed up to the fornix, and a medicated swab on the end of a holder being introduced until it touches the cervix. The speculum is withdrawn a little, and then both speculum and swab are slowly withdrawn. The vaginal walls close on the swab as it projects above the end of the speculum, and thus the medicament becomes applied to them.

2. Powders may be insufflated into the vagina, when it is opened up by a speculum or by the fingers.

3. Medicated suppositories may be introduced—*e.g.*, iodoform suppositories may be used after operations on the vagina or cervix.

Absorption does not take place through the vagina so quickly as through the rectum.

The Uterine Douche.

In the treatment of various affections of the uterus it is necessary to douche the uterine cavity. The stream of fluid is obtained from a reservoir elevated above the patient. The elevation must be slight because only a stream of small force is wanted. The instrument, which is passed into the uterine cavity, should be of such a nature as to allow of an easy return outflow through the cervix. The double catheter of Fritsch or Budin is very suitable.

Fig. 12.—Fritsch's double catheter.

Method of use.—As the uterine douche in gynecology is generally only used with some operative treatment in which the uterine cavity is involved, it is given when the patient is in the lithotomy position. The vulva and vagina should be thoroughly cleansed. The cervix may or may not be steadied with a volsella. A speculum may or may not be introduced into the vagina. The cervix must be large enough to admit the catheter easily without filling it. Artificial dilatation must be used if necessary.

The stream should flow through the instrument before it enters the cervix, in order that no air may be introduced. It must be allowed to enter the uterus slowly.

Various forms of lotion are used—*e.g.*, boiled hot water, antiseptic solutions—*e.g.*, boracic, corrosive sublimate, carbolic, &c.

The great danger in the use of the uterine douche is that the outflow may be stopped, and the fluid forced along the Fallopian tubes.

The Uterine Plug.

In gynecological practice the introduction of a plug for any length of time into the uterine cavity is rarely required. It is used to cause the uterus to contract and to check hæmorrhage in certain cases—*e.g.*, after the removal of an intra-uterine polypus, sometimes after the removal of an incomplete abortion where the uterine walls are flabby, in some cases of severe bleeding from cancer or sarcoma of the uterus. In such cases it is usually combined with the vaginal plug.

In such cases, iodoform gauze is the material to use. It should be carefully introduced by means of a speculum and a long pair of forceps.

In cases in which the cervix is split for stenosis, a small plug of iodoform gauze may be introduced between the raw surfaces for one or more days in order to prevent them from coming together.

In inoperable cases of carcinoma cervicis, the excavated cavity may sometimes be treated by introducing a plug soaked in some antiseptic and astringent lotion—*e.g.*, liquor ferri subsulphatis (1 to 2 of water), or carbolic lotion (1 to 40) in which is dissolved alum (1 of alum to 12 of lotion). In such cases the vagina is packed as well.

Other methods of applying medicaments to the uterine cavity.—Besides the use of the douche and of the plug in the special conditions indicated, the following methods may be employed :—

1. *The swab* may be used. In order to apply a styptic or an antiseptic to the uterine cavity in diseased conditions or after operations, an ordinary sound or a special vulcanite or metal applicator may be used, its end being covered for an inch or two with a layer of antiseptic cotton wool; or a wooden applicator may be employed and afterwards destroyed.

The patient is placed in the Sims or in the lithotomy position, a speculum passed, and the cervix steadied with a volsella. The cervical canal should be large enough to easily admit the sound. After curettings and other operations there is usually no difficulty in regard to this. First a clean dressed sound should be passed to cleanse the cavity. Then the sound, soaked in the desired medicated fluid, should be introduced. In order to make the application to the whole cavity it may be necessary to pass two or three swabs.

During the application cotton-wool should be held in the vagina, against the cervix, in order to catch any excess of the fluid that may run back from the cervix.

Some of the medicaments employed are an alcoholic solution of iodine (iodine, gr. lxx., iodide of potash ℥iss, alcohol ℥i), iodo-tannin (a saturated solution of tannin in this iodine mixture), strong carbolic acid, iodised phenol (iodine, 2 parts, with carbolic acid, 8 parts).

To remove the dressing from the sound after use it is best to unroll it between the thumb and fore-finger under water.

2. *A small syringe* with a narrow nozzle is used by many instead of the swab, especially after curetting, the removal of polypi, &c.

The patient is placed in the lithotomy position, a speculum passed, and the cervix pulled down and steadied with a volsella. The cervical cavity must be large enough to allow of *a free return outflow* alongside the nozzle. The fluid must be injected very slowly.

The objection to this method is that fluid may be forced along the Fallopian tubes. If, however, the cervical canal be roomy and the injection be made slowly, there is no danger. In many schools it is largely used.

3. *Solid medicaments* are seldom introduced into the uterus now-a-days. The use of solid caustic is practically given up.

Sometimes, for purposes of antisepsis, iodoform pencils are introduced into the cavity—*e.g.*, after operations on the uterus.

The Use of Baths.

In chronic inflammatory pelvic conditions, the judicious use of baths may lead to great improvement in the patient's health. *Entire baths* may be employed. Such a form of treatment is usually carried out at a watering-place—*e.g.*, Bath, Kreuznach, Kissingen, &c. The benefit derived in such cases is partly due to the improvement in the circulation, skin, bowels, kidneys, and other organs from the action of the baths, but mainly to the changed surroundings of the patient, freedom from care and overwork, regularity and simplicity of life, which are part of the bath-treatment. Various saline waters—*e.g.*, those containing common salt, bromides, and iodides, are mostly employed.

In the treatment of uterine fibroids, also, similar means may lead to good results. Sea-baths are also good in many cases.

Hip or sitz baths are also very beneficial. They may be hot or cold, and may be given at special watering-places or at hydropathic establishments, or used by patients at their own homes.

The hot hip-bath should be taken immediately before the patient goes to bed. The temperature should be the highest the patient can bear comfortably (110° to 120° F.). She should sit in the tub so that the water covers the pelvis. Her body should be warmly covered at the time. At first, she should remain in the bath only for a couple of minutes. Afterwards the length of time should gradually be increased and she can remain seated till the water gets tepid. After the bath, the skin should be thoroughly rubbed, and the patient should go to bed.

Sea-water may be used, or water in which two or three handfuls of common salt are dissolved. Two or three tablespoonfuls of mustard, also, improve the condition of the water.

If the patient is using the vaginal douche, it is convenient to take it before she leaves the bath.

This treatment should be discontinued during menstruation. It is continued according to the nature of the case. Thus, in certain cases of dysmenorrhœa, where the pain occurs just before or at the beginning of the menstrual period, the hip-baths may be taken only for three or four nights before the flow begins.

In old inflammatory conditions they may be used every other night for one or more weeks.

Cold hip-baths are also valuable as a stimulus to the circulation. They should be taken in the morning.

Massage.

The value of massage in the treatment of many bodily ailments has been thoroughly established. In recent years its beneficial influence in many chronic pelvic diseases has been pointed out. Massage may be general or local.

General Massage.—In many cases of neurasthenia in women, from whatsoever cause, the employment of systematic massage combined with seclusion, rest in bed, careful feeding and, perhaps, electricity, have proved of great value in restoring the patient to health.

In some of these cases, the advice of the gynecologist is often sought, because one or more of the most prominent symptoms are referred by the patient to the pelvis. There may or may not be any local trouble of importance. If there be none, no local treatment should be undertaken, even though the patient should locate the cause of her illness in the pelvis. Such a case will be best helped by the treatment above indicated, generally referred to as the Weir Mitchell method.

In this treatment, the skin and muscles of the whole body, and the joints of the limbs are carefully massaged once or twice a day for half-an-hour or more at a time; the course lasts for several weeks.

In the majority of instances, the patients are restored to health.

Local massage.—In recent years, owing to the work of Brandt, Hartelius, Nissen, Asp, and others, local massage of the pelvis has been employed by different gynecologists in the treatment of chronic pelvic conditions—*e.g.*, versions and flexions, prolapsus uteri, chronic inflammation, fibroids, &c.

These various forms are used :—

External—which consists in the stroking and kneading of the lower abdominal region, the flat hand, the fingers or the knuckles being employed.

Bimanual.—In this, the fingers of one hand are passed into the vagina, into the rectum, or into both of these passages, the outer hand being on the abdomen. The internal finger should not be moved, but should push up and steady the parts which are massaged by the outer hand.

These forms of massage should last only ten or fifteen minutes. The periphery of swellings should be first manipulated.

Passive.—This consists merely in exercising steady pressure or traction on adhesions. This method should last only a few minutes.

After massage, the patient should lie quiet for a little.

It is always well that this form of treatment should be combined with the use of vaginal douches and baths. The introduction into the vagina of dilators—*e.g.*, Bozeman's, or of vulcanite plugs like those of Prochownik, for a few hours in the day, in cases of pelvic adhesions, may help to soften and stretch the tissues, and so will aid the massage.

Contraindications.—All acute inflammations, menstruation, pregnancy, phthisis, distended tubes.

Expediency of local massage.—Though the circulation of blood and lymph is undoubtedly benefited, and though the absorption of exudations may be promoted, I think the dangers to the woman's psychical organisation are too great to admit the method of pelvic massage to a place among the therapeutic agencies of the gynecologist. It is stated by those who practise this system, that the manipulations require

to be carried on for weeks or months. This is sufficient, in my mind, to condemn the method. Stimulation of the sexual centres cannot fail to be brought about, and, as a result of this, the patient may suffer in various ways. I believe that there is scarcely a case in which massage is at all necessary. Equal or better results can be obtained by other therapeutic means. A striking example of this is seen in the treatment of *prolapsus uteri*. Brandt's massage method in the treatment of this condition is as follows :—

The patient, with loosened clothes, lies on a table or couch, cushions being placed under her chest. An assistant passes his fingers into the vagina, and pushes the uterus upwards and to the front. It is then drawn up as far as possible. The woman next supports her body on elbows and feet, while the physician forcibly separates and closes her knees three times. This method is troublesome and unpleasant to the patient, and is of very little value. By pessaries or operation much surer benefit may be derived.

Schultze's method.—Schultze recommends the breaking-down of adhesions under chloroform.

This plan has not been much tried. It should be practised with great care. There is considerable risk of setting up hæmorrhage or of injuring viscera. Above all, the physician should feel very sure that the tubes are not distended, and that there is no pus collection anywhere in the pelvis.

The Thermo-Cautery.

The thermo-cautery is valuable in certain cases. It may be used to remove urethral caruncles, small growths on the vulva, piles, to open abscess cavities and cysts of the vulva,

to puncture and destroy Nabothian follicles, &c. It is also used as a hæmostatic on wounded surfaces.

Instrument.—Paquelin's cautery is the best form. The cones are kept hot by the burning of benzoline vapour, which is pumped continuously through the hollow handle. Cones of various sizes and shapes may be obtained.

Before pumping the vapour, it is necessary to heat the end of the cone in a flame. Care should be taken not to bring the reservoir of benzoline near a flame.

The cautery should be used when the cone is dull-red in colour. If white-hot the hæmostatic action is lost.

A button-cone may be used with this cautery if applications are to be made to the spinal region.

Abdominal Bandages.

Abdominal bandages may be of service in various conditions—*e.g.*, pendulous belly, with or without pregnancy, tumours of large size in the abdominal cavity, floating kidney, after operations on the abdominal wall, after abdominal section, after child-birth, in separated recti, and umbilical hernia. Abdominal bandages may also be used to keep dressings over the genitals, to hold vaginal pessaries, &c. The most common form used after operations is a wide bandage, made of domette or of linen, long enough to encircle the abdomen and pelvis with the dressings, and to overlap. It should reach from the level of the great trochanters to near the ensiform. The dressings of wool should be so distributed as to allow of equable pressure by the bandage. With such a bandage, the patient must remain as quiet as possible in bed. It is very apt to slip upwards.

When a patient has to wear a bandage—*e.g.*, in a case of

pendulous belly, while she moves about, such a form is not convenient, because it tends to become greatly wrinkled and to slip. It can be much improved by the addition of shoulder and thigh straps. In all such cases special bandages made of elastic material, or containing elastic, should be employed. Support is needed, particularly for the lower abdominal region.

Complete elastic bandages may be used ; they are slipped on over the legs. But more convenient are the forms which can be strapped on one side or at the back.

When the bandage is only partly elastic, the elastic portion may be in front, behind, or at the sides. The lower border should fit rather tightly in order that it may not easily slip up. To prevent creasing and slipping upwards with certainty, it is a good thing to attach thigh-bands to the bandage. These may be made of silk, covered cloth, or, better, of rubber. These must not fasten too near the middle line, or the bands will tend to slip into the fold between the nates. The chemise should be worn under the bandage.

For floating kidney a similar bandage may be used, along with a hard cushion of wood, vulcanite, or metal, covered with leather, attached to the spot over which the special pressure is to be made. Or a mere abdominal belt with the cushions attached may suffice, if, in addition, thigh-bands be used to keep the belt in position. Also, a cushion may be kept in position by a truss-like arrangement.

Abdominal bandages are also used for the purpose of keeping dressings in the vulvar or sacral region in position. The commonest form is the well-known T bandage. A

special bandage may be obtained; it consists of an abdominal girdle with four straps attached, two in front, and two behind. These straps support a pad which rests against the perineum.

Small dressings may be kept in place by straps of adhesive plaster, unless the patient objects strongly to their use.

Abdominal bandages are of service in giving attachment to certain vaginal pessaries, or perineal supports, in cases of bad prolapse of the uterus or anus, when the patient will not allow operative measures to be employed.

Pessaries.

During the last few years the opinions of many of the leading gynecologists have undergone a marked change with regard to the value of pessaries in the practice of gynecology. Many forms of pessary have been devised during the present century, and their claims have been advocated by many physicians of greater, or less, renown. To refer to them many pages would be needed, and though such a survey might prove interesting, it would scarcely be suitable for a practical treatise at the present time.

Owing to comparatively recent researches, whereby we have acquired much accurate knowledge regarding the physics of the pelvis, the normal relations and movements of the various parts of the pelvic floor, the real significance of their various displacements and the correct estimation of the symptoms caused by them, the employment of pessaries has been largely lessened. Of very great importance also in bringing about this change, are the advances which have been made in the operative treatment of some

of the conditions for which pessaries have long been used.

I think it best to consider pessaries in reference to the conditions for which they have been employed.

Certain forms I shall not describe, because I consider them to be not only unscientific in principle, but dangerous or unserviceable when in actual use. I refer to the intra-uterine stem pessary in particular.

Pessaries have been used in the following conditions. I shall refer to each of these in relation to this method of treatment :—

Anteversion of the uterus.—For a long time this term has been used to describe a supposed special diseased state of the uterus. In this condition the uterus is enlarged, and the long axis of the uterus more or less straightened, owing to the diminution of the normal slight anteflexion. The symptoms were related to this altered condition of the uterine axis. Such views must now be considered as absolutely untenable. They are incorrect.

There is no special disease of anteversion. Nor does anteversion produce any symptoms. Anteversion is but one of the results of the thickening of the uterus, due to chronic metritis. Even in normal states the uterus may often be found with very little flexion. The treatment of anteversion is the treatment of metritis. Special antever-sion pessaries, such as Gehrung's, Thomas', and Graily Hewitt's, were introduced when incorrect ideas as to the pathology of the condition prevailed. They were meant to lie in the vagina, and by means of a projecting portion to press through the anterior fornix against the uterus, whose wall would thereby become bent over it. It was also

believed that the pressure of the body would thus be taken off the bladder.

Now we know that no special influence can be brought to bear on the corpus uteri through the anterior fornix by such instruments. Even if a slight flexion were produced (probably it could not be brought about), the relation of the uterus to the bladder, and to the rest of the pelvic floor, would remain the same, as far as intra-abdominal pressure is concerned.

Such instruments must be abandoned. As I have already stated, the treatment is that of metritis. Sometimes in this condition it may be helpful to support the uterus for a time in order to relieve congestion where it is much enlarged, and tends to drag down. This support may be given by the use of vaginal glycerine plugs, which help to relieve the congestion, as well, in another way.

But a ring or Hodge pessary may be used for this purpose —without any reference, however, to the so-called anteverted condition of the uterus.

Anteflexion of the uterus.—There is considerable difference of opinion as to the exact relation of anteflexion of the uterus to the causation of pain and sterility. It is extremely probable that excessive anterior flexion *per se* is rarely the cause of these conditions, for many examples may be found of healthy women in whom this peculiarity of the uterus may be found, unaccompanied by any symptoms. There is a considerable range of normal variation in the extent to which flexion is developed in the uterus. It is to pathological accompaniments of the anteflexion that we must look in those cases in which distressing symptoms are found. These are inflammation in the uterine wall or

outside the uterus, or stenosis of the *os externum* or *os internum*.

The treatment of anteflexion is simply the treatment of these associated pathological conditions. For a long time uterine stem-pessaries have been used for the purpose of straightening the uterus. Their use is based upon a wrong understanding of the pathology, and they are dangerous because of the injury they may cause to the uterine mucosa, and because they may lead to septic infection. All forms of this instrument should be abolished, whether simple firm stems like Amann's, soft rubber stems like Greenhalgh's, or firm stems combined with vaginal pessaries like Beigel's.

In cases in which the uterus is much enlarged from inflammation, support of the organ for a time by means of vaginal plugs, Hodge or ring pessaries, may be beneficial. Their use has, however, nothing whatever to do with the presence or absence of anteflexion.

Retroversion of the uterus.—There is some difference of opinion as to the part played by a backward displacement of the uterus in the causation of symptoms, which are so often found accompanying the condition. Some hold that retroversion *per se* does not produce troublesome symptoms; they state that normally the uterus is constantly changing its position, according to changes in the condition of bladder and bowel, and that it may, when turned to the back, trouble the woman as little as when turned to the front. They state that the symptoms which are so often found along with retroversion—*e.g.*, pain and weakness in the back, menorrhagia, &c., are due to accompanying pathological conditions — viz., inflammations outside the

uterus, inflammations in the uterus itself, sub-involution, or some prolapse of the organ.

In favour of these opinions may be mentioned the fact that cases are found in which, along with a retroverted uterus, no symptoms whatever are found. Moreover, the forward position of the uterus, as a whole, does not seem necessary to health, because, in certain cases, retroposition of the uterus may exist along with perfect health.

Other authorities hold that the backward displacement *per se* may lead to bad symptoms.

As regards the use of pessaries, the former school hold that they should be used in a smaller number of cases. They state that the instruments act by supporting the uterus as a whole, relieving the congestion, and thus tending to the improvement in the pathological conditions accompanying the backward displacement.

The latter school hold that, whenever the uterus is retroverted, it should, if possible, be turned to the front, and kept there by means of a pessary. They hold that the instrument gives relief because it keeps the uterus anteverted.

It is not necessary to enter into a consideration of these two views. I would merely desire to point out that considerable attention must be paid to the statements of the former school. I am inclined to think that the influence of the retroversion *per se* in causing symptoms has been greatly exaggerated.

Whatever views may be held regarding the pathology of retroversion, it may be stated that, as regards the treatment of the condition by pessaries, they are to be used with discrimination, and only when necessary.

Various Conditions of Retroversion considered in relation to Treatment by Pessaries.

1. Retroversion accompanied with fixation by means of peritonitic adhesions.

In such cases the uterus cannot be replaced—*i.e.*, turned to the front. Pessary treatment is of no avail. The case must be treated by douches, baths, electricity, glycerine plugs. Stretching of adhesions by means of massage or by means of vaginal dilators—*e.g.*, Bozeman's—is recommended by some. (Other recommendations as regards operative interference I will consider afterwards, *vide* p. 211.)

2. Retroversion of a freely movable uterus, not enlarged, unaccompanied by pelvic trouble.

In such cases there seems to be no necessity, as a rule, for the replacement of the uterus and the introduction of a pessary. When, however, women in such a condition are liable to the strain of heavy lifting or to chronic bronchitis, it may be considered advisable to use a pessary for the purpose of keeping the uterus anteverted. For, undoubtedly, the uterus may, when retroverted, show a greater tendency towards prolapsus under the influence of increased intra-abdominal pressure than when it is anteverted. In these cases the Hodge or Albert Smith pessary does well.

3. Retroversion of the freely movable puerperal uterus, unaccompanied by pelvic troubles.

It is now recognised that normally, in many women, during the involution of the uterus in the early weeks after labour, the uterus may be turned to the back.

When, in such cases, good health exists, no pessary treatment is necessary, unless it is known that the patient has

suffered previous to her pregnancy, in early pregnancy, or unless she is subject to strains which increase the intra-abdominal pressure.

The Hodge or Albert Smith pessary may be used in these cases.

4. Retroversion of the movable pregnant uterus in the early months. In every case the uterus should be replaced, and a pessary worn until the pregnancy has well entered the fourth month—*i.e.*, until all danger of an incarceration in the pelvis is past.

The Hodge or Albert Smith pessary may be used.

5. Retroversion of a movable uterus, where pelvic symptoms are present, but where the ovaries are not prolapsed into the pouch of Douglas, nor any special tenderness exists in the perimetric or parametric tissues.

In such a case the uterus should be replaced, and a Hodge or Albert Smith pessary introduced.

6. Retroversion of a movable uterus where pelvic symptoms are present, and where one or both of the ovaries are prolapsed into the pouch of Douglas.

These are generally very troublesome cases to deal with. If the ovaries be inflamed as well as prolapsed, no pessaries should be used until glycerine plugs and the vaginal douche have been used. After the uterus be replaced it is often a matter of difficulty to select a pessary. In a certain number of cases owing to the sensitiveness of the ovaries no form of instrument can be worn. In other cases a Hodge or Albert Smith pessary acts well and causes no pain even though the ovaries remain prolapsed. A Thomas' pessary with a thick soft rubber upper end may often be more suitable than entirely hard instruments, or a soft rubber

ring pessary may often be borne when no hard instrument can be tolerated. In all cases where the ovaries are noticeably tender or inflamed, it is best, after the use of the douche and plugs, to use a ring pessary for a time before trying one of the hard instruments. Though the ring may not keep the uterus to the front, merely acting as a general support to the uterus, it has a beneficial influence in allowing congestion of the uterus to be relieved.

In some cases of prolapse of one ovary only, benefit may be obtained from the use of a hard instrument in which the upper angle on one side is absent to ensure non-pressure on the ovary, while the pessary is in position.

7. Retroversion of a movable uterus, accompanied by pelvic symptoms, where old posterior perimetritis or some remains of cellulitis are present.

These cases are also very troublesome. The line of treatment as regards pessaries is the same as that laid down in the last section.

Retroflexion of the uterus.—All that has been said regarding the use of pessaries in the treatment of retroversion may be stated with regard to retroflexion. Practically, wherever retroflexion exists retroversion is present, and the employment of pessaries like Hodge's and Albert Smith's, after the replacement of the uterus, is related primarily to the posterior version, not to the flexion. Disappearance of the flexion depends on the consistence of the uterus and its relation to the intra-abdominal pressure.

Downward displacements of the pelvic floor.—The pelvic floor is liable to various downward displacements. The floor is to be regarded as a strong suspensory structure which closes the pelvic outlet. Its strength is mainly

due to certain dense fascial layers, but also to several muscles.

The main conditions which are related to the formation of displacements are increase in intra-abdominal pressure, weakening of the structures which compose the floor, solutions in continuity of the floor.

The whole floor may be displaced downwards. This is a rare condition. It is sometimes found in early life or in cases of injury—*e.g.*, where a heavy cart wheel has passed over the abdomen.

Practically we have to deal only with partial displacements of the floor. In several of these forms pessaries may be beneficially employed.

1. The anterior vaginal wall (*anterior enterocele*), or it along with the bladder (*cystocele*), alone prolapse.

In these cases a ring pessary, a diaphragm ring, or a Hodge pessary with transverse bars in its lower half may be used with benefit. But in cases where there happens to be marked rupture of the perineal body, only the ring pessaries need be tried, and even they may not be retained.

The operative treatment for cystocele will be referred to afterwards (*vide* p. 259).

2. The posterior vaginal wall alone (*posterior enterocele*), or it along with the anterior rectal wall, may become prolapsed. In such cases the same forms of pessaries may be tried. Operative treatment is important (*vide* p. 256).

3. *The uterus alone* may be prolapsed. In this condition the uterus usually lies retroverted.

As the condition becomes more marked it tends to drag down the structures attached to it.

It is only the slight degrees of prolapse to which this

section refers. In such cases a Hodge or Albert Smith pessary should be tried. A ring may also be used, but only where the others fail.

4. The *uterus* may be considerably prolapsed along with the *anterior* and *posterior vaginal walls*. In these cases a Hodge pessary may be used to keep up the parts, but if there be a bad rupture of the perineum, it will not remain in position. The ring may then be often used with advantage. The Zwanck may be serviceable. Some prefer to use a ball pessary.

The operative treatment is important.

5. The downward displacement may be so extensive that the uterus protrudes beyond the vulva.

In these cases, especially if of old standing, no pessary will remain in the vagina, unless it be held in position.

For these cases the operative treatment (*vide* p. 256) should be carried out. Where this is inadvisable or is objected to, the cup pessary attached to an abdominal belt, or a T bandage, may be employed. In dispensary practice one sometimes finds that women prefer periodic packing of the vagina with oakum. This should only be carried out after the menopause.

The operative treatment for such cases will be considered afterwards (*see* p. 256).

Fibroid tumours of the uterus.—In cases of small fibroids of the uterus giving rise to dragging down symptoms, the use of a Hodge or ring pessary may be beneficial in supporting the organ.

Forms of pessaries.—Hodge's pessary is a valuable one. It consists of two parallel side-bars joined at the lower end by a straight cross-bar, and at the upper end by a curved bar,

whose concavity looks towards the lower end of the pessary. When viewed from the side, it has a sigmoid curve, in order that it may, when in position, fit the vagina properly. It is best when made of vulcanite, because it is pliable if placed in hot water for a little, and so can be moulded to any desired shape ; it gets firm again when cold.

Vulcanite does not get soiled as does gutta-percha, and it does not soften in the vagina so easily as celluloid.

The pessary can be obtained in various sizes, and with

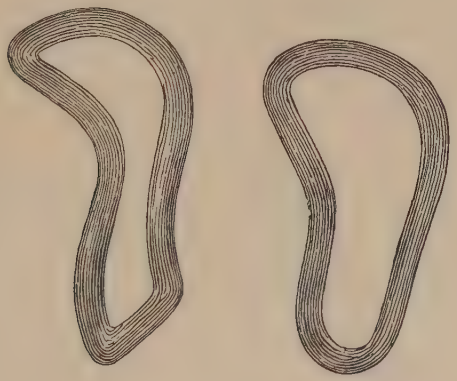


Fig. 13.—Hodge and Albert Smith pessaries.

different degrees of sigmoid curve. Very often the upper end curves too markedly forward.

Albert Smith's pessary consists of two lateral bars joined by rounded ends. The bars are not parallel, but are wider apart at the upper end of the instrument than at the lower. Viewed laterally it has the sigmoid curve. It is best made of vulcanite. Very often this pessary is too markedly curved forwards at the upper end, and the lower end is in

many too pointed. It is then apt to slip out of the vagina if the introitus is wide, and is liable to interfere with coitus.

Both of these pessaries may be obtained with transverse bars across their lower part.

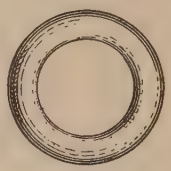


Fig. 14.—Ring pessary.

Gaillard Thomas' or Munde's pessary is somewhat similar in shape, but the upper end is thick. It may be made of vulcanite or of gutta-percha; when of the latter, this end forms a soft cushion, which fills the posterior fornix when the instrument is in position.

Schultze's figure-of-eight pessary is greatly used in Germany, but it has no advantages over the above mentioned forms.

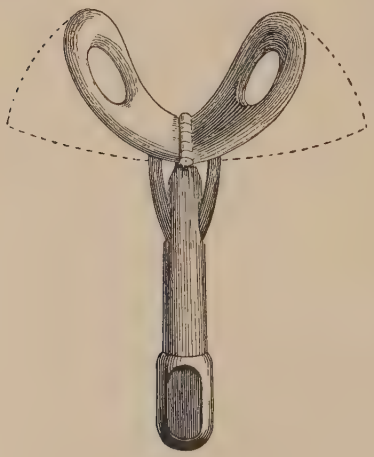


Fig. 15.—Zwanck's pessary.

The ring pessary is made of various materials—*e.g.*, wood, vulcanite, metal, india-rubber. The most convenient are the indiarubber forms. Some are hollow, containing a spring, others are of solid rubber.

The diaphragm-ring is simply the last mentioned form, with a perforated rubber diaphragm.

Ball or egg pessaries are made of vulcanite or wood.

The Zwanck or Zwanck-Schilling pessary consists of two perforated wings of vulcanite or metal, connected by a hinge-joint. At right angles to them run bars, which are joined to a screw-stem. By means of the screw the wings can be opened out or brought together.

Vagino-abdominal pessaries are those which, though meant for the vagina, are kept in position by means of abdominal support. There are various forms of these. Cutter's may be taken as a type. In it there is a curved stem, which is fastened to an abdominal belt in the middle line of the back, passes down over the sacral region, anus and perineum into the vagina, where it supports a cup on which the uterus rests.

Method of Using Pessaries.—*Preliminaries.*—A careful bi-manual examination must be made in order to determine the special requirements of the case, as well as the size of the instrument necessary. If the uterus be retroverted it must be turned so that the fundus looks towards the front, by means of the sound, or by the fingers, assisted by the genu-pectoral posture. The patient is then placed on her left side, with the knees drawn up, under cover of a sheet.

Introduction of instrument (*a*).—Hodge, Albert Smith, Thomas or Mundé pessary.

The lower end is grasped between thumb and fore-finger of the right hand, the upper end having been greased with vaseline. The labia are separated posteriorly with the fingers of the left hand. When the introitus is narrow the perineum is pulled back. The instrument is then introduced, with its plane surface, in line with the vulvar slit—*i.e.*, parallel to the table. It is directed backwards towards

the sacral hollow, until it is little more than half within the vaginal orifice. The right index finger is then placed under the pessary against the upper bar. The instrument is then rotated so that its plane surface lies parallel with the vaginal walls. It is then pushed upwards until the upper end rests in the posterior fornix.

In pushing it upwards the finger must be directed well backwards in order to oppose the tendency of the instrument to slip into the anterior fornix. The most difficulty is found where the vagina is narrow, and the parts rigid. No pain should be caused by the introduction.

(*b*) *Ring pessary*.—This form is introduced in much the same manner as that just described. When a soft, rubber ring is used, it is compressed by the thumb and forefinger of the right hand while it is being passed through the vulva in order not to stretch the parts and cause pain.

(*c*) *Zwanck pessary*.—The wings are brought together, and are then passed into the vagina. The screw of the handle is then turned so as to cause the blades to be separated sufficiently to enable the instrument to remain in position.

After-considerations.—When the pessary has been passed the patient is asked if she feels any pain or discomfort, and she is made to press down or to cough, in order to determine how the pessary fits. She then rises, and is tested standing erect, with her body bent at right angles to her limbs, in the position of micturition (if necessary), and walking.

The lower end of the instrument must not project beyond the vulva—must not press against the symphysis. It should lie just within the introitus, and should not press hard against the urethra. The upper end should not push up

the fornix unduly. The vagina must not be stretched transversely by the Hodge, Smith, Thomas and Mundé forms. With the others it must not be too much stretched in this direction. The patient should be instructed to return if she is troubled with discomfort or pain while wearing the instrument.

If the woman douches, the pessary need not be removed and cleansed oftener than once in six or eight weeks, if it be of vulcanite. Removal should be more often in the case of soft rubber, though it is difficult to get patients to bother to return in order to have the instruments changed. The pessary may be worn for months, or for more than a year, according to the necessities of the case.

Contraindications to the use of pessaries.—Fixation of the uterus, so that the fundus cannot be turned to the front. Interference with the mobility of the uterus, as a result of some swelling—*e.g.*, tumour of ovary, &c. Recent acute inflammation in any of the pelvic tissues or viscera. Tenderness of the vagina from vaginitis. Certain tumours of uterus or of vaginal wall.

Some ill-effects of pessaries.—Pain may result. The functions of the bladder or of the rectum may be interfered with. Ulceration of the vaginal walls or cervix may occur. Perforation of the rectum, of the bladder, or of both may take place. Coitus may be made difficult.

These troubles may result from pessaries when they are too large, when misplaced, when not kept clean, when worn too long without change, or when some contraindication has not been regarded.

Mode of action of pessaries.—1. Pessaries of the Hodge type.

It used to be taught that when this pessary is in position the intra-abdominal pressure acts chiefly on the lower end of the instrument, thus pushing it downwards, and causing the upper end to rise and move somewhat forwards in the posterior fornix, thus pushing the uterus forwards. This is not the explanation. When the pessary is in position it lies in the vaginal slit between the pubic and sacral segments.

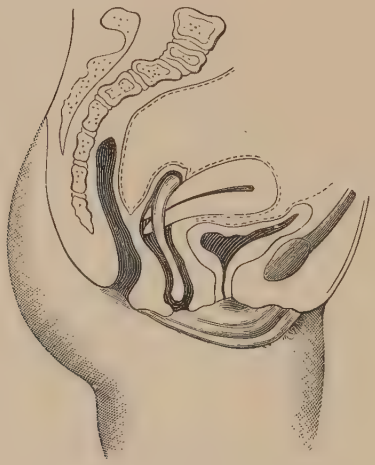


FIG. 16.—Pessary (Thomas') in position.

Intra-abdominal pressure acts at right angles to every point of the floor, and consequently acts with equal force on all parts of the pessary.

The pessary acts in two ways :—

(*a*) It helps to keep up the uterus as a whole, thus tending towards the relief of the congestion of the organ.

(*b*) The upper end of the pessary affords a support over

which the posterior vaginal wall pulls on the cervix in an upward and backward direction, the body of the uterus consequently tending to be kept forwards. In fact, this action makes up for the loss of function in the utero-sacral ligaments which, in the normal state, draw the cervix upwards and backwards, but which in cases of retroversion of any length of duration lose this power through the stretching to which they are subjected.

2. Ring pessaries act merely as a general means of support. They lie between the pubic and sacral segments, stretching the vagina more or less. They tend to prevent the vagina or uterus from becoming prolapsed. The ring does not act in the posterior fornix like the Hodge pessary in the majority of cases. Sometimes, it may have this action, and prevent the uterus, which has been replaced, from becoming retroverted again.

3. Zwanck's pessary acts in virtue of the width of its wings. These remain in the vagina, and tend to keep the uterus from descending. Patients sometimes prefer this instrument because they can so easily introduce and remove it.

4. Ball pessaries act merely through occupying a large amount of space in the vagina.

5. Vagino-abdominal pessaries keep up prolapsing parts by means of the suspension from the abdominal band.

The Use of Electricity.

The exact value of galvanic electricity as a therapeutic agent has not yet been definitely established. By some authorities it is employed to an enormous extent in their practice, by others it is not at all used, and by others

it is used to a very limited extent. One school holds that in certain cases—*e.g.*, fibroid tumours, its action may lead to the disappearance of the abnormal growth; another holds that it is merely to be ranked among other methods of bringing about improvement in certain symptoms.

One great objection to its use is the time and trouble required.

Apparatus employed.—The galvanic current is produced by the action of certain solutions on two different metals. In practice, batteries of different sizes are used. It is convenient to use one in which a considerable strength may be obtained. Stationary or movable batteries may be used. They are usually in the form of a cabinet. Each battery must possess apparatus by which different numbers of cells may be connected with the circuit.

There should be a galvanometer, an indicator of the nature of the two poles, a current interrupter, and a commutator, which enables the current to be quickly altered. With these batteries also the necessary apparatus for producing Faradism or electric illumination may be employed.

The rheostat, an instrument which alters the strength of currents by placing resistances in the line of the currents, may also go along with the battery. It is useful in allowing the current to be gradually increased or diminished without the slighest shock, and thus serves well with nervous patients.

Different forms of terminals or electrodes are employed to bring the current into relationship with the diseased tissues of the pelvis. Electrodes are external and internal. The external electrode is generally applied to the lower part of the abdomen above the pubes, where direct electrical action is required; sometimes over the sacrum, where indirect

action is wanted. They may be made either of wet potter's clay, half an inch thick, or of block tin or lead, perforated with small holes and lined with a layer of cotton-wool, chamois-leather, or rough towel-cloth. These electrodes vary from four to ten inches in diameter. The smaller they are the more the patient is apt to feel pain. Before use they should be moistened in warm water. It should be kept steady while the current is passing by a bandage passed lightly around the abdomen.

Internal electrodes are used in the vagina, in the uterus, in the bladder, in the rectum, or in the substance of masses —*e.g.*, certain fibroids. Most commonly vaginal ones are employed.

Vaginal, rectal, and vesical electrodes are of various shapes and sizes—*e.g.*, round, bulbous, or elongated. The staff on which they are held should be covered with vulcanite or rubber tubing to insulate it.

For the vaginal portion of the cervix a cup-shaped end may be used. For the uterine cavity various forms are used. The most common is that shaped like a uterine sound. Platinum ends should be employed. The positive pole will not corrode this metal, nor gold nor aluminium.

For puncture of tissue a steel needle is used.

Action of galvanic current.—It is taught that there is a *polar* action chemical in nature, that at the positive end differing from that at the negative; and, also, an *interpolar* action as the current flows from one pole to the other. The effects depend upon strength of current and duration.

The effect of the positive pole is described as the hardening, coagulating, and hæmostatic one; it is less painful than the other pole. The effect of the negative pole is said to

be to disintegrate tissue, to cause congestion, to favour hæmorrhage; it is the caustic, painful pole, being more active chemically than the positive.

Puncture of tissue is carried out chiefly in cases of fibroids where a sound cannot be passed into the uterine cavity. But it may be combined with intra-uterine electrization.

Faradic electricity.—This may be used externally, internally, or both externally and internally. Where the internal application alone is used, a double electrode, with an insulator between, may be employed.

The chemical action resulting from Faradic electricity is very slight. It has mainly a stimulant and contracting effect.

Nature of applications.—The patient should be douched before and after the application with an antiseptic. She should rest for a little afterwards. The length of the application is from five to eight minutes in most cases. Where pain is being treated the applications may be longer. They may be given daily, every other day, or twice a week, according to the conditions present. Various strengths of currents are used. The highest limit may be considered 300 milliampères. A very common range is from 50 to 150.

Conditions in which Galvanism has been Recommended.

Uterine atrophy, superinvolution, infantile uterus, associated with amenorrhœa and local loss of tone.

Faradic or galvanic electricity may be tried externally, or best, both externally and internally at the same time. In virgins it may be impossible to carry out the internal appli-

cation. When the Faradic current is used it does not matter which pole is in the uterus or vagina. When the galvanic is used, there is a difference of opinion as to which should be introduced ; the current should not be strong.

Dysmenorrhœa associated with, or without, local inflammatory conditions. In these cases, the combined external and internal galvanic currents of mild strength are used, the positive pole being internal. In virgins it may only be possible to make external application.

Myoma uteri.—The galvanic current is used. The internal electrode is placed in the uterine cavity when possible, and is the negative pole unless it is a hæmorrhagic case, when the posterior pole is placed there ; or the inner electrode may penetrate the tumour for one to two inches. The puncture is made on a part of the fibroid within easy reach. Vessels of any size should not be wounded, if possible. The puncture is usually made with the negative pole. The most thorough antiseptic precautions must be obeyed.

Puncture of the tumours through the abdominal wall is to be deprecated.

Metritis, endometritis may be benefited.

Chronic cellulitis, chronic ovaritis, salpingitis, perimetritis, peri-ovaritis, old hæmatocele, and peri-salpingitis, are often improved. Also pelvic pains in neurotic patients may be helped by applications. The negative pole is usually placed in the vagina.

Affections of the rectum. –Electricity is used by some in the treatment of hæmorrhoids and of prolapse of the bowel. The galvanic current may be passed, one pole being on the abdomen the other in the rectum. Where the piles

are large, electro-puncture with the positive pole may be used.

Faradism of the bowel is recommended for chronic constipation by some.

Bladder troubles.—For irritability or incontinence, abdomino-spinal, abdomino-vaginal, or abdomino-urethral applications of galvanism may be employed. When there is hyper-sensitiveness of the neck of the bladder, the positive pole is passed as far as this region.

Ectopic pregnancy.—The value of electricity in destroying an ectopic pregnancy has not yet been definitely ascertained. Some authorities would never employ it, others believe in using it during the first three months of pregnancy. Faradism and galvanism have both been used. The patient should be in bed. One electrode—the negative—is placed in the rectum or vagina, the outer on the abdomen over the cyst.

Contraindications and dangers.—The electrical treatment should not be carried out where there is any acute inflammatory condition in the pelvis. Nor is it advisable where there is any collection of pus. In some cases it may be advisable not to employ it if the patient is particularly sensitive.

We are not yet sufficiently aware of the dangers that may result from the use of electricity, even in supposed suitable cases. Pelvic inflammation may undoubtedly be set up. Hæmorrhage may be started. This may result from the influence of the negative pole, from irritation of the uterine mucosa, or from the perforation of a large vessel when electro-puncture has been tried. Septic infection may be caused.

Points to be attended to during the application.—The patient must be placed in the dorsal position. It is well to assure her that the application will not be of the nature of a shock. The clothing is loosened and the external electrode is placed on the abdomen and kept steady by the use of a lightly applied bandage. This should be allowed to remain for a little before the current is passed in order that the skin may be well moistened. If there is dryness more pain will be caused. Any abrasion of the skin should be protected with oiled silk. The electrode should be covered with a dry piece of cloth or of oiled silk to protect the clothes from moisture. The internal electrode is then introduced, the vagina having been cleansed before the patient has lain down. The end of the electrode should be cleansed and dipped in an antiseptic solution. It is introduced as a uterine sound would be, being guided by fingers placed in the vagina. There should be little or no pain in introducing the instrument. If electro-puncture is to be made, the uterus must be steadied through the abdominal wall. The wires are now attached to the electrodes, the condition of the apparatus having been tested beforehand. The galvanometer needle is at zero.

The outer electrode may now be lightly pressed against the belly by the patient's or by a nurse's hands. The electrodes must be steady, and the legs should not be allowed to touch them.

It is best not to employ a vaginal speculum. If it must be used, the electrode must not touch it or a shock will be caused. Neither must it be allowed to burn the vaginal wall.

No sudden shock must be allowed—*e.g.*, by the slipping of a wire from a screw. In stopping the application it is best gradually to reduce the strength by turning off the current bit by bit, or by increasing the resistance by the rheostat, until the galvanometer points again to zero. The wires are then removed, then the internal electrode, then the outer. The vagina is then cleansed. After puncture a styptic may be used and a vaginal plug. The patient must rest afterwards.

(For full details regarding the use of electricity, the works of Apostoli, Engelmann, Cutter, Keith, and others, may be referred to.)

Antiseptics.

A wounded surface may be infected with germs or their products in the following ways :—

By the hands of the operator, of his assistants, or of nurses.

By means of instruments, apparatus, and other paraphernalia used in the operation.

Owing to the non-cleansing of the patient.

By means of the air.

In gynecological operative work, as in all surgical work, our aim should be not merely to use antiseptics, but so to handle the patient as to keep every wounded surface *aseptic* from the beginning of the operation until the end of the repair process, which leads to the closure of the wound. In the gradual evolution towards what is now known as aseptic surgery, the part played by antiseptics is more restricted than in the early Listerian days.

It is necessary that every operator should thoroughly

master the details of the modern method of clean surgery. There is no doubt that partial knowledge may in certain cases lead to errors as serious as those which proceed from ignorance. Thus an operator may take a piece of silk ligature from a drawer, soak it for a few minutes in 1 in 30 carbolic solution, or 1 in 2000 corrosive sublimate, and then use it as a suture, under the belief that he has satisfied all the requirements of the aseptic system. Such a proceeding, in the light of present knowledge, is as serious as if he were to pick a suture from the floor and use it. Because it has been shown that certain micro-organisms will not be destroyed by these solutions unless left soaking in them for hours. Then, again, some think that if ligatures or instruments are placed in water raised to the boiling point for a minute or two, all germs and spores will be destroyed. This is well known not to be the case. Then, again, many believe that certain dry dressings which are impregnated with antiseptics, now so largely used, are all powerful destroyers of germs; whereas, in reality, it is only when in contact with liquids that their activity is shown. It is evident, then, that dry dressings, unless sterilised immediately before application to wounds, may be carriers of living germs and spores.

It is necessary, therefore, to study the best means of carrying out all operative procedures in order that the wound may not become infected.

The organisms which are most frequently the source of infection are :—

Staphylococcus pyogenes aureus.
Streptococcus pyogenes.
Bacterium coli commune.

The following may also cause trouble :—

Staphylococcus pyogenes albus.
Staphylococcus pyogenes citreus.
Staphylococcus epidermidis albus.
Gonococcus.
Bacillus pyocyaneus.
Diplococcus pneumoniæ.

In discharges from the vaginal tract many organisms are found, a large proportion of which are pathogenic for animals.

In the healthy vagina these may be found, though their pathogenic power is much diminished or latent. Their power may possibly develop in full strength if the organisms are planted on another soil—*e.g.*, uterine mucosa.

The Operator, Assistants, and Nurses.—The operator should not, immediately previous to the operation, have visited any infectious case, nor have been in contact with putrefying organic matter—*e.g.*, post-mortem specimens.

Before all major operations, it is recommended by some that a special clean suit of clothes should be put on. This is not necessary. It is sufficient to remove the coat, roll the shirt sleeves up as far as the shoulder, and to envelop the body in a long sterilised apron, with short sleeves, which fastens behind. This apron should be waterproof. Some operators prefer to wear a sterilised linen or cotton apron outside this.

To cleanse the hands and arms, turpentine, soap, and warm water should be first used, the skin and nails being carefully cleaned with a brush. Then the surface should be well brushed with 1 in 1000 acid corrosive sublimate solution, 1 in 1000 iodic hydrarg. solution, or 1 in 100 warm

lysol solution. They may afterwards be soaked in these solutions for a little before the operation is begun. Alcoholic solutions of the mercuric salts are probably best.

During the operation the hands should be washed from time to time in one or other of these lotions. In abdominal sections, however, weaker lotions should be used as a rule.

Every assistant and nurse who may touch the wound, or handle anything which comes into contact either with the operator's hands or with the wound, should cleanse hands and arms in the same manner as that just described.

The most glaring faults may be committed through non-attendance to this rule. Thus one may see a nurse looking after dressings, sponges, or instruments, with the sleeves of her dress scarcely raised above the wrist; and in the intervals of her occupation she may be noticed to pull up the sleeves from time to time. Or she may rush to secure an arm or leg of the patient which has broken loose. Or she may carelessly place the dressings on her sleeve before passing them to the operator. In the training of nurses it is most important that they should be taught the necessity of attention to minutiæ. They should, moreover, have a thorough understanding of the rationale of the aseptic system, in order that they may work intelligently.

Instruments, Apparatus, Swabs, Ligatures, &c.—(*a.*) *Instruments.*—Instruments should be made as simple as possible in order to afford no gathering-places for germs. They should be made entirely of metal where possible. All locks should be separable. By careful scrubbing and polishing, all gross or perceptible dirt can be removed from them. Before they are used in operations, they require to be made aseptic.

Sterilisation is most surely carried out by means of heat. A dry heat of 150°-180° C., kept up for a few minutes, will suffice. Moist heat is more efficacious. Compressed circulating steam at 130° C. will destroy all micro-organisms and spores.

Various forms of sterilising chambers are used. These methods cannot in all cases be easily carried out. A simple substitute consists in boiling the instruments. Half-an-hour's boiling will ensure complete disinfection. According to Tavel, less time is required with a $\frac{3}{4}$ per cent. solution of common salt. If sodium carbonate (exsiccated) be added sufficient to make a $\frac{1}{4}$ per cent. solution, the instruments will not rust.

After being sterilised, the instruments should be placed, during the operation, in an antiseptic lotion—*e.g.*, 1 in 40 carbolic, 1 in 200 lysol, 1 in 4000 hydronaphthol, or 1 in 40 boric.

After operations, the instruments should be thoroughly washed in warm soap and water, sterilised, and then dried.

Drainage tubes should always be kept in a jar of antiseptic solution.

Rubber articles should not be boiled. Dishes which hold instruments should be made of glass or porcelain.

(*b*) *Apparatus.*—All basins, ewers, douche tubes, &c., which may be used by operator, assistants, or nurses, or which may be brought near the wound, should be thoroughly washed beforehand in a strong antiseptic lotion—*e.g.*, 1 in 500 corrosive sublimate, 1 in 20 carbolic, &c.

(*c*) *Gauze, cotton-wool swabs, ligatures, towels.*—Sponges are now almost entirely unnecessary in gynecological opera-

tive work. Instead, pieces of gauze or cotton-wool, medicated or not, are sued. For abdominal sections, prepared pieces of gauze are the best; a square is made of eight thicknesses of gauze, each side measuring about ten inches, the edges being hemmed. Or they may be made of rolls of wool enclosed in sewed bags of gauze.

These swabs must either be sterilised by moist air or boiled for half an hour in the above mentioned soda-salt solution. Afterwards they may be kept in carbolic, corrosive, or other antiseptic lotion. Before use they may be soaked in sterilised water and thoroughly squeezed. They may be used several times during an operation if the blood be washed out. But if any dirty matter like pus touches them, they should be at once thrown into the fire. No swabs should be used in more than one operation.

All towels and cloths used during the operation should be sterilised in the moist air chamber or boiled for half an hour in the soda-salt solution, afterwards being wrung out of an antiseptic lotion.

Silk ligatures are to be boiled in the same manner, and then placed in an antiseptic lotion.

Catgut ligatures are prepared in various ways. The best are chromic gut and gut prepared in the oil of juniper wood. Before being used they should be washed in ether, and then thoroughly soaked in an antiseptic solution—*e.g.*, 1 in 1000 iodic hydrarg. It is well to have a small supply constantly soaking in the antiseptic.

Sponges should be prepared as follows:—At first they should be washed in water slightly acidulated with hydrochloric acid until all effervesence, due to the action on lime contained in the sponge, has ceased. They are then soaked

in sterilised water for an hour or two, and carefully cleaned. Then they are placed in an antiseptic solution—*e.g.*, carbolic, for twenty-four hours. Afterwards they are squeezed and thoroughly dried, and preserved dry in a closed bag until wanted. Before the operation they should be soaked for twenty-four hours in 1 in 20 carbolic lotion. After an operation they are soaked in water until all the blood is dissolved out; then placed in a covered dish containing soda solution (one pound of soda to twelve sponges) for twenty-four hours. Then they should be thoroughly washed for hours in hot water, and afterwards in the antiseptic lotion as above described.

Dressings, whether of wool or gauze, should be freshly sterilised. Dry dressings from the manufactory, even if impregnated with an antiseptic, may contain germs. The antiseptic is active only in the liquid state. The sterilisation may be carried out by means of a hot chamber, by boiling in the soda-salt solution, or by soaking in an antiseptic lotion.

Cleansing of the Patient.—(*a*) *In operations on the external genitals, perineum, and natural passages.*—If possible, the patient should take a bath the night before the operation, the body being well scrubbed with soap and warm water. It is well that the vagina should be thoroughly douched with an antiseptic for several days beforehand. Some pack the vagina each night with iodoform gauze as well. A purgative should be given at bed-time, and an enema in the morning. After the bowel is moved, the nurse should thoroughly wash out the lower gut with warm boracic lotion (1 in 30). Before the operation, the bladder should be emptied.

If the external genitals are to be operated upon, as much hair should be shaved from the labia majora and mons veneris as is necessary to give a clear field of operation.

In such cases, some prefer to apply a boracic or carbolic poultice to the vulvar region during the night before the operation. This is really only necessary when there is a very dirty surface, which may be difficult to clean thoroughly otherwise. In the ordinary run of cases, it is sufficient, after shaving off the hairs, to scrub the vulva, the perineal, and anal regions, the vagina, and the inner sides of the thighs with warm water, turpentine, and soap. Then these parts are thoroughly washed with an antiseptic solution—*e.g.*, 1 in 1000 of corrosive sublimate.

During the operation the instruments may lie in boracic or weak carbolic lotion (1 in 60).

The field of operation may be irrigated permanently with an antiseptic lotion by means of a douche, or it may simply be swabbed from time to time. The lotion should not be of such a nature as to hurt the instruments, *e.g.*, boracic lotion (1 in 40), solution of iodic-hydrarg. (1 in 5000), or of hydronaphthol. Some use the simple boiled soda-salt solution. It is quite non-irritating to wounds.

The interior of the uterus is cleansed by strong antiseptic lotions introduced by swabs or by a double catheter.

After operations, the tract may be insufflated with iodoform or naphthalene powder, and a dressing of sterilised antiseptic gauze or wool used.

(*b*) *In operations in which the abdominal cavity is opened.*

a. Per vaginam.—The method already described will suffice. In such a case it is well to pack the vagina with iodoform gauze two or three nights before the operation, as

well as to douche the passage. Before the peritoneum is opened into at the operation, the interior of the uterus should be thoroughly cleansed.

b. Through the abdominal walls.—The vagina should be douched with an antiseptic for several days before the operation. The evening before, a thorough cleansing of the body with soap and warm water should be made. Afterwards the nurse should wash the abdomen, mons veneris, and upper aspect of the thighs with soap, turpentine, and water; the navel should be cleaned with chloroform or ether. It is a good thing to shave the mons veneris at this stage. Some prefer to do it when the patient is under chloroform. A poultice of iodic-hydrarg. (1 in 4000) or of carbolic acid solution (1 in 40) should then be applied to the abdominal wall, and not removed until the patient lies on the operating table. Solutions in glycerine are best. They penetrate the skin, and do not dry up. A purgative is given, and an enema in the morning. The rectum is washed out with warm boric or hydronaphthol lotion, and the vagina is douched. The urine is then drawn off if the patient cannot empty her bladder.

In every case where the uterine cavity is likely to be opened during the abdominal section, it is well to endeavour to disinfect it before the operation by a douche, swabs, or by pencils of iodoform. It is best done when under chloroform. When the patient is placed on the table and anæsthetised, the abdominal dressings are removed. The skin is again washed with turpentine and water, and then bathed with an antiseptic lotion. The abdominal surface is then surrounded with sterilised Mackintosh sheetings, on which sterilised towels, wrung out of a

warm antiseptic lotion, are placed. On these, instruments may be laid when necessary.

The instruments are taken from trays of weak antiseptic lotion. Sterilised gauze and wool swabs may be washed in the sterilised soda-salt solution, or in weak iodic-hydrarg. or hydronaphthol lotion. They should be thrown away when saturated with blood.

If sponges are used, they should be washed in a series of basins of antiseptic (not corrosive) and soda-salt solutions. Before the swab or sponge is used, it should be taken from the latter lotion, because it is quite non-irritating to raw surfaces or to the peritoneum.

If it is necessary to wash out the abdominal cavity, the sterilised soda-salt solution suffices, though simple boiled water may be tried. Some recommend weak boracic lotion, sublimate lotion (1 in 10,000), or iodic-hydrarg. (1 in 15,000) in cases where pus or other germ carrying material has found its way into the peritoneum. Such antiseptic lotions are of very little use. They are not strong enough to kill all germs and spores, and they may damage the peritoneum somewhat.

In all cases the cavity should be thoroughly dried before closure. Strong antiseptics easily damage the peritoneum, and so interfere with its action. Serous surfaces will better digest infectious matter if the endothelium be normal.

In all abdominal sections this power of the peritoneum should be remembered. The greatest danger of the local overcoming of this power results from the presence of fluid—*e.g.*, blood in which the germs may rapidly grow. The line of the incision and the surrounding parts should be dusted

with iodoform or naphthalene powder, and covered with sterilised antiseptic gauze pads, or with gauze pads containing wool. The pads should be held in position by a piece of iodoform gauze, which is fastened to the abdominal wall with collodion. Outside this, layers of sterilised antiseptic cotton are placed, and the whole enveloped in a bandage.

Cleansing of the Air and Contents of the Room.—In the early days of antiseptics, great attention was directed to the *air infection* of wounds. Now it is recognised that it is very much less to be feared as a source of danger than infection by *contact* or by *implantation.*

To reduce to a minimum the risk of air infection, operations should be done in rooms with smooth clean walls and ceiling, with simple fittings and furniture. There should be no hangings, mats, carpets, nor any unnecessary articles which might collect dust. The dust is to be removed by ventilation, and by washing the room and its contents thoroughly.

Some operators like to burn stick-sulphur all night before the operation, the doors and windows being firmly sealed. In the early morning the smoke is removed by ventilation. I think it is better to carry out this procedure the day before, and to allow fresh air to remain in the room all night. In this way there is less sulphurous acid gas in the room during the operation. This is apt to irritate the patient's throat, causing spasm of the larynx, thus rendering the administration of the anæsthetic unpleasant.

It goes without saying that no source of decaying organic material should be near the room—*e.g.*, a faulty drain pipe or water-closet.

Various Chemical Antiseptics.—I. Those used in Solution. II. Those used in Solid Form.

I. Those used in Solution.—*Corrosive sublimate.*—This is a valuable antiseptic. It must be remembered that it is not active when dry. Therefore germs and spores may lie in or on dressings containing it, without being destroyed. In strengths which can be used without great risk of absorption, its solutions vary greatly in their destructive action on germs and spores. It is important to bear this in mind. Some think that mere contact with a 1 in 1000 solution is sufficient to destroy all organisms. This is not so. Some will withstand its action for hours or for a day. Zimmermann found that pieces of flesh soaked for five minutes in this solution were not with certainty sterilised, though there is no doubt that the germs that are not destroyed are weakened in activity. For this reason, it has been recently recommended that at the end of an operation the wound (not peritoneal) should be washed out with a solution of the strength of 1 in 500.

With corrosive solutions, especially if strong, there is danger of absorption by the system, and consequently of toxic symptoms.

The risk of this may be diminished if, after the sublimate is used, the wound be washed out with a $\frac{3}{4}$ per cent. sterilised salt solution.

A pure corrosive solution should not be used, because it forms with albumen insoluble and inactive albuminate of mercury, its power in this way being weakened. This is especially marked when there is much fluid—*e.g.*, leucorrhœa, cancerous discharge, blood.

To the corrosive solution should be added a little tartaric acid, in order to prevent the formation of the albuminate. A $\frac{3}{4}$ per cent. or 1 per cent. solution of tartaric acid should be used in making up a 1 in 1000 corrosive solution. Common salt has the same action. Tartaric acid is best added before using the corrosive. If it be added to strong solutions it changes the mercuric salt to calomel in two or three weeks.

The objections to the use of mercury are that it is toxic if absorbed to any extent into the system. It corrodes metallic instruments and loses its strength somewhat when they are immersed in it, because the mercury tends to be deposited on them. Sponges, also, are hurt by it. Glass and porcelain are not injured by it.

Biniodide of mercury or mercuric iodide.—This salt is believed to be very valuable. It does not form insoluble compounds with albumen, and it does not corrode metals much. It is used in strengths of 1 in 1000, 1 in 2000, &c.

Iodic-hydrarg.—(Mercuric-potassio, mercuric iodide.) This is a most valuable antiseptic. It is a soluble form of mercuric iodide. It does not form an albuminate with albumen. It is not irritating nor so toxic as sublimate when it is absorbed by the system. It is rapidly eliminated by the kidneys. It is said to have twice the germicidal strength of corrosive, and it is safer to use in the peritoneal cavity.

Hydronaphthol.—This material is non-poisonous, non-irritating, non-corroding, and a strong antiseptic. It may be used in solutions of 1 in 1000, 1 in 2000, &c. Weak solutions may be used to flush out the peritoneum.

β-Naphthol.—This may be used in watery solution. The

saturated solution is only 2 per cent. in strength. Boracic acid helps its solubility.

Carbolic acid.—The ordinary 1 in 20 solution is a good antiseptic, save in the case of the spore-bearing bacilli. But contact for several hours is necessary in the case of some. It is in favour of carbolic lotions that they do not hurt instruments.

They are easily absorbed into the system by means of raw surfaces, and may cause toxic symptoms. They also act unpleasantly on the skin of the operator. This substance is, therefore, not so serviceable as some other antiseptics. Supplies of ligature may be kept in solutions of it, to be ready for use.

Lysol. —This is an alkaline fluid, derived from the saponification of cresols. It is incompatible with acids. It is said to be a stronger germicide than carbolic acid, and less poisonous. It is used in a strength of 1 in 100 as a douche, for washing the hands, and for instruments.

Boracic lotion (30 in 1000) and salicylic lotion (1 in 1000) are non-irritating, and may be used for instruments or for washing out the rectum or bladder.

Thymol.—This substance is a good antiseptic. As 1 part is soluble only in 1500 of water, glycerine should be added if stronger solutions are desired. Ordinary strengths employed are 1 in 1000 to 1 in 2000.

Iodoformised or *bichloride* collodion should be used when it is desired to fasten dressings to the skin around the wound.

Ferripyrin.—This substance is highly recommended by Witkowski as an astringent, anæsthetic, antiseptic, without irritant action. A 16 per cent. watery solution can be applied to a bleeding or diseased surface, with a swab or

dressed sound. A 1½ per cent. solution can be used for irrigation of wounds or on plugs. Solutions varying in strength from 1 to 16 per cent. can be used for bladder bleedings. In stomach or bowel hæmorrhage it can be administered by the mouth.

II. Used in Solid Form.—(*a*) *Iodoform.*—This substance is used as powder, in pencils for introduction into the uterus, as pessaries for the vagina, and in gauze. It may also be used in a solution of alcohol and ether, as follows :—Iodoform 10 parts, alcohol 80, ether 20. It is a valuable antiseptic, but it becomes active only when fermentation has begun. By this action the iodoform is decomposed, and the products are said to unite with the ptomaines and toxalbumins, and so to prevent the development of the germs.

Germs and spores may live among iodoform without being affected. They cannot, however, continue septic processes where the iodoform is abundant.

It is, probably, according to Kocher, the most active agent in combating decomposition. It really serves no purpose when placed on wounds which heal aseptically, but it is of great value in those where sepsis usually occurs.

Toxic effects are produced by its absorption—*e.g.*, rise of temperature, frequent pulse, mental dulness, and there may be delirium, collapse and coma.

Iodoform gauze may be made as follows :—Pure gauze is sterilised by boiling, and then soaked in the following solution :—

Iodoform, 50 grammes.
Glycerine, 100 ,,
Ether, 700 ,,

The gauze is then passed through a drying roller-machine, and then dried at a temperature of 30° C. It can then be preserved in air-tight cases.

Tannin may also be added to give the gauze an astringent hæmostatic action.

Sterilisation of iodoform gauze can be carried out by boiling.

Corrosive sublimate.—Sublimated gauze and wool may be made by boiling the pure material in sodium carbonate solution (20 in 1000), then in corrosive solution (1 in 1000). Afterwards it is dried. Dry gauze or wool is inert as regards germs and spores. All articles, therefore, from manufactories should be sterilised before being used.

Salicylic acid is also used in powder or in gauze.

Naphthalene.—This is a cheaper material than iodoform, and may be used as a powder for sprinkling on raw surfaces or in abscess cavities. It may be used, combined in equal parts, with iodoform, or it may be mixed with a little calamine powder in order that it may be less sticky.

Ferripyrin can be used in powdered form.

Apparatus, Ligatures, Instruments, &c.

The operating-table should be simply constructed. It should be made of metal—*e.g.*, galvanised iron—so as to be easily cleansed.

For operations on or by way of the natural passages, the patient should be placed in the lithotomy position, her buttocks projecting slightly over the end of the table. The legs may be held up by assistants, but it is more convenient to employ leg-rests fastened to the end of the table, or a

special leg-holder, which is attached to the knees, and is held by a strap passed around the table.

A simple arrangement may be adopted by means of a walking-stick and a long bandage. The stick is placed in the flexion of the knees, fastened to them by the bandage, which is also passed around the neck of the patient or under the table. The feet and legs of the patient should be covered with clean stockings.

The patient's hips should rest on a piece of rubber cloth, or, better, on a circular rubber pad with a raised rim on a projection, which extends over the table-end into a collecting basin.

In private practice these operations may be performed on a convenient table, but sometimes it is necessary to place the patient on the edge of the bed. In the latter case the knees may be held up conveniently by means of the walking-stick and bandage.

Attached to the operating-table may be stands to hold dishes of instruments and swabs. These may be placed on chairs, or may be given to the operator by assistants.

A good window-light should shine on the patient's buttocks. The operator sits on a stool facing the end of the table.

For operations in which the incision is made in or through the abdominal wall, the patient may be placed on a high table covered with a blanket and sterilised rubber cloths. The patient lies on her back, wearing clean stockings and a flannel night-dress. The latter is well drawn up under her chest. Hot water bottles are placed on each side of her legs. The latter are covered with a sterilised cover, which is securely fastened around the table. The patient's

arms should be fastened to the table or pinned to the pillow.

The operator stands on one side, usually the right, and his assistant on the other.

A good window-light should shine on the abdomen of the patient, either from above or opposite the end of the table.

An improvement upon the flat table is an arrangement by which, during abdominal sections, the lower limbs may be somewhat elevated. This is the position which is most favourable to the administration of anæsthetics, and is most apt to benefit those cases in which the cerebral circulation tends to become dangerously disturbed.

Some operators prefer to operate standing or sitting at the end of the table between the patient's legs, which are raised and held by supports. Frau Horn's table is the best known one, and is used by Martin of Berlin.

In certain cases the Trendelenburg position may be employed. To place the patient aright, the lower end of the ordinary flat table may be raised, or a specially constructed apparatus may be employed to raise the patient's pelvis to a higher level than that occupied by her head.

For use in abdominal sections, a good electric lamp with a reflector is often valuable in illuminating deep parts of the pelvis or abdomen when the window light is not good.

The operating-room must be well warmed (25° to 30° C.). The air should be moist, in order that exposed peritoneum may not suffer.

Needles.—For passing ligatures through the pedicle in the removal of tumours by abdominal sections, in vaginal colpotomy or in vaginal extirpation of the uterus, the best

needle is one attached to a long handle. It should be full curved, and the point should not be sharp. Different shapes are used. The needle may be in line with the handle, at right angles to it, or at an obtuse angle. The latter forms may be obtained with the needle attached on the right or left side of the handle.

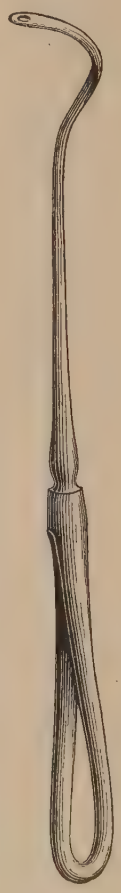


FIG. 17.—Pedicle needle.

For other purposes—*e.g.*, the repair of the perineum, amputation of the cervix, &c., it is best to use needles with a needle-holder. The most convenient needles are the full-curved ones, such as are so largely employed by Martin of Berlin. The curve allows them to be passed easily when working in a deep wound. Different sizes may be obtained, from the large ones used in suturing the abdominal walls after section to the small ones used in suturing a wounded intestine. In passing these needles the hand must turn well, because of the curve they have. The simplest and best needle-holder is Martin's. It should have a separable lock.

Sutures.—Silver wire has been used in gynecology, but it may safely be said that it is practically unnecessary.

Silk is largely used in various sizes, twisted or plaited. Its chief use is in securing the pedicle of ovarian and uterine tumours, in suturing the abdominal

walls after section, and in extirpation of the uterus. The thickest silk is generally known as "pedicle silk." It is twisted. For the abdominal walls plaited Chinese silk is largely employed (Nos. 7 and 8).

The value of silk is its strength and durability. Its resistance to absorption is the great objection to it. It is apt to set up irritation, and may lead to the formation of a sinus. Being very porous, it may easily carry germs. For these reasons some operators never use it where sutures are buried—*e.g.*, in the abdominal cavity or in the bottom of deep wounds. Martin, for example, uses it practically only for the closure of the abdominal incision, catgut being employed for all other purposes.

FIG. 18.—Martin's full-curved needles.

Catgut.—There is no doubt that this is by far the most widely used and most serviceable material for most ligatures and sutures. It may be obtained in four sizes, from No. 0, used in suturing a wounded intestine, to No. 4, used where important vessels are to be secured. No. 4 is used by Martin in abdominal operations, where most other operators use silk.

The great advantage of catgut is that it lasts long enough for purposes of healing, and that it is then absorbed by the tissues when in position. Its durability depends upon its size and nature. The range of juniper gut is from one to three weeks. Chromic gut is more durable.

It must be noted that catgut may easily rot if kept too long, or if not carefully prepared or kept. It tends to fray out if at all injured, and the knot may slip if not carefully tied. The knot should be triple and not double.

Different preparations of catgut are employed. The well-known carbolised gut should not be used. It is not so reliable as the following forms:—

Chromic catgut.—This is prepared by taking 5 parts of the best gut, on the stretch, soaking it in a mixture of chromic acid (1 part), and distilled water (12 parts), then, after wiping it in a cloth, placing it for twelve hours in 100 parts of sulphurous acid. It is then dried.

Juniper catgut.—The best gut is soaked for five or six hours in corrosive solution (1 in 1000). It is then placed in the oil of juniper wood for eight or more days, and afterwards preserved in alcohol, to which

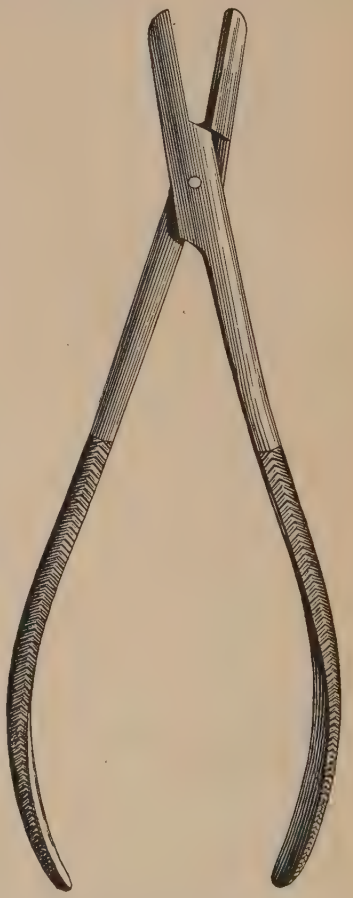


FIG 19.—Martin's needle-holder.

a tenth of the essence of juniper is added. Some recommend sterilising the gut for three or four hours after it has soaked in the corrosive solution.

However catgut is prepared, it is perhaps well at first to wash it in ether or benzene, in order to remove any grease that may be on the surface. The chromic gut is the longest to disappear.

Before being used in operations the gut must be thoroughly sterilised.

Silk-worm gut.—This is impermeable and non-absorbent, not so strong as silver, and less flexible. It may be used where silver would be used. Some use it in cases where silk might be employed. Its knot is apt to give. It should be soaked in an antiseptic before use. It is easily cleaned.

Horse-hair is seldom used, and is not necessary. It is used by some to bring skin surfaces of an abdominal wound together. Catgut, however, serves well for this.

Different forms of Sutures.—*Separate sutures.*—These may be passed in a single row, or there may be two or three rows, according to the depth of the wound. In such cases the ligatures are tied on the skin.

Separate tiers of sutures may be used in order to close the wound thoroughly from the bottom upwards. The buried sutures should be of catgut.

In the closure of wounds the great desideratum is, if possible, to bring the raw surfaces together accurately, without leaving spaces between them in which serum or clot can accumulate. The raw surfaces should be aseptic, they should not be injured by chemical reagents, nor by mechanical means—*e.g.*, squeezing, compression. Healthy tissue is not a good soil for bacteria. It has a resisting

influence against them. Blood clot or serum lying in a wound, on the other hand, is a splendid soil.

When in any case we cannot ensure this exact closure of a wound, it is best to establish free drainage, and to dress regularly with antiseptics.

Separate sutures are not so reliable in thoroughly closing wounds of some depth as the continuous suture.

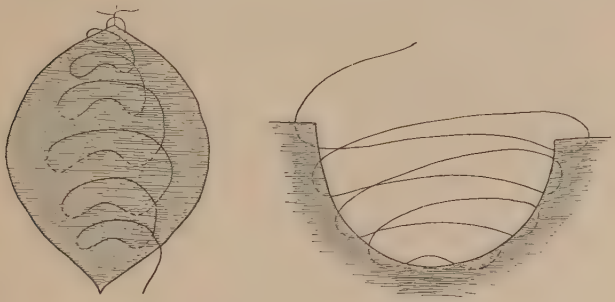
Continuous catgut suture.—This suture is most valuable. It serves not only to bring wounded surfaces together; but it is also a splendid means of checking hæmorrhage. The gut is passed continuously by means of a curved needle, the full-curved form being best for difficult cases.

A single row of turns of the suture may be sufficient in the case of a small wound. These may pass through skin and as much subjacent tissue as is wounded. In beginning the suturing it is best first to close the upper skin angle of the wound by tying a knot. On the short end of the suture a pair of forceps is fastened, and held tight by an assistant. In this way a *point d'appui* is afforded for the suture. The wound is then closed as the needle is passed through the skin surface, a quarter of an inch or more from the edge. After each passage of the needle the suture is pulled tight, and is held firm by the left hand of the operator, or by an assistant.

Some prefer to pass the needle under the loop made immediately above, before the latter is drawn tightly. To tie the knot it is best to follow Martin's procedure. When the needle is to be passed for the last time there should be an end to the suture, of some length, projecting from the needle. The end is held on the side of entrance, while the needle is passed completely. With the latter are two pieces

of the gut. They are pulled tightly, and then tied to the single end on the other side of the wound. In making a knot the first turn should be double and the rest should be as in an ordinary reef-knot. Besides this, it is well to add a third part to the knot.

When a wide or deep wound is to be closed, the same method is employed in a series of stages, from the bottom of the wound to the skin-surface. The upper angle of the skin portion of the wound is closed as described. The



1. 2.

FIG. 20.—Diagrams to illustrate method of using the continuous catgut suture.

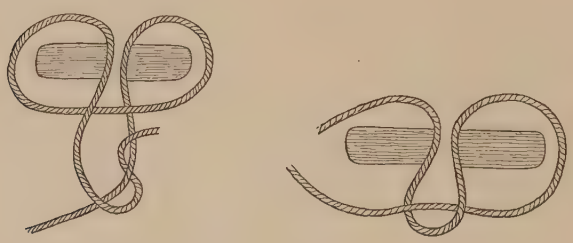
1. Surface view. 2. Sectional view.

needle is then entered deeply, passing from side to side, bringing the lowest portions of the raw surfaces together. The assistant keeps the suture constantly tight. A second stage is now passed with the same suture, bringing together the wounded surfaces just above the level of the first stage. Third and fourth stages may be added if necessary. Finally the skin is closed.

In closing a deep wound a little caution is needed not to

allow little cavities to remain, nor to cut with the needle previously passed sutures. If a suture is too short for the complete closure it may be tied, and another one started, beginning by a knot near where the other stopped. The whole process must be carried out with strict regard to asepsis.

Ligature en masse.—It is important that the different methods employed to control bleeding from the pedicle in case of the removal of the appendages, of tumours, &c., should be thoroughly known.



1. 2.

FIG. 21.—Ligatures applied to a pedicle.
1. Staffordshire knot. 2. Bantock's knot.

When the pedicle is not large the Staffordshire knot of Lawson Tait, Bantock's knot, or several interlacing ligatures, may be used. For each of these the ligature is passed through the pedicle by means of a pedicle needle. A part is chosen which has no large vessel. The needle is then withdrawn.

Staffordshire knot.—The loop is thrown over the mass to be removed, until it rests on the free ends. One of these is then drawn through this loop so as to rest on it. Both ends are drawn tight so as to constrict the pedicle. They are then tied, the first part of the knot having a double turn.

Bantock knot.—When the needle is withdrawn, one of the free ends is carried around the pedicle, passed through the loop and tied to the other free end on the other side of the pedicle.

Interlacing ligatures.—When the needle is withdrawn

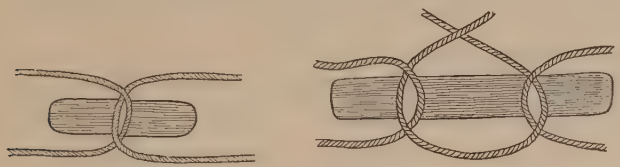


FIG. 22.—Double and triple interlacing sutures.

the loop is cut, and the two parts are interlaced. One part is tied on one side of the pedicle, the other on the other. In the case of a larger pedicle it is best to employ more than two interlacing sutures. For this purpose the needle must

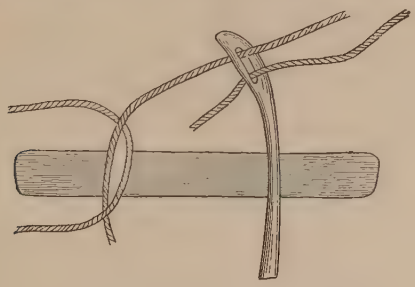


FIG. 23.—Method of passing interlacing sutures.

pierce the pedicle more than once. A simple method of carrying this out may be seen in Fig 23.

Elastic ligature.—This is practically only applied to the pedicle in case of removal of fibroids, in abdominal hysterectomy, and Cæsarean section. It may be used

temporarily, or it may be left in position for days—*e.g.*, in extra-peritoneal treatment of the stump in abdominal hysterectomy.

The best round, strong rubber band should be used. Different methods are employed for holding the ends after the pedicle is embraced. Both ends may be held in a small grooved piece of metal or vulcanite. They may be tied with silk, or may be held in a strong pair of forceps close to the pedicle. A special instrument may be employed to tighten and hold the ends—*e.g.*, Pozzi's.

Forceps.—Ordinary artery forceps are greatly used in various operations. Greig Smith's, Spencer Wells, and Kocher's forceps, with separable locks, are very convenient forms.

Of great value for forcipressure in different abdominal operations are the medium sized and long forceps of such patterns as Keith's. The Péan-Richelot forceps are of use in controlling the broad ligaments in vaginal extirpation. Other special forms of forceps will be referred to in connection with the operations in which they are used.

Drainage.—Drainage of wounds, not connected with the peritoneum, may be carried out by means of rubber tubes, whose sides are perforated. Antiseptic gauze may also be employed. Sometimes glass tubes may be used.

When the peritoneal cavity is to be drained through the abdominal opening, various plans may be tried. Glass tubes, with small perforations in the sides, may be used. Generally they are passed into the pouch of Douglas through the abdominal wound near the lower angle. When the wound is closed all the sutures are tied except the one immediately above the tube. It is fastened when the tube

is withdrawn after 6, 12, 24, or more hours as the case may be. While the tube is in position, any fluid that gathers in it may be withdrawn from time to time by means of a syringe and rubber tubing. By some, antiseptic gauze or lamp-wick is used along with the tube to give constant capillary drainage.

In certain cases of abdominal section a large tampon has

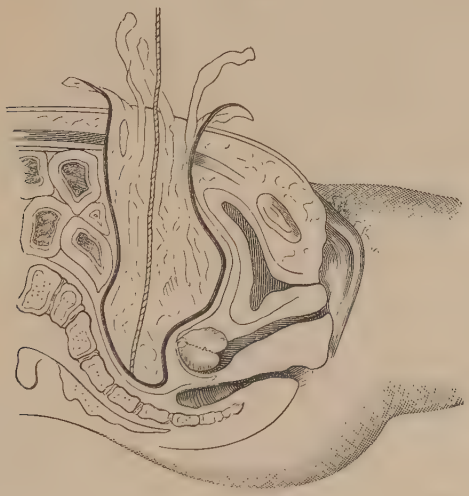


FIG. 24.—Mikulicz's plug.

been used by some operators. It is hæmostatic, antiseptic, and allows of drainage. Mikulicz's plan is to make a long sac of iodoform gauze, which is placed in the part of the cavity to be plugged. To the bottom of the sac a long piece of string is previously fastened. It is brought out through the opening of the bag. The sac is then packed with a series of strips of gauze. The order in which the

strips are placed in the sac should be marked by strips of coloured yarn attached to their outer ends. They should be removed in the reverse order of their introduction. It is an advantage also to place a drainage tube in the very centre of the mass.

All excess of iodoform should be removed from the gauze beforehand by beating it, in order to lessen the danger of absorption.

The tampon is left in position, according to the amount of oozing. It is impossible to lay down exact rules. Mikulicz states that the gauze packing may be removed after 48 hours, and the sac later. Fresh gauze may be introduced. Sometimes it may be necessary to drain the peritoneum through the vaginal fornix. This may be done by a T-shaped rubber tube. Iodoform gauze may be placed in the vagina, which may be douched from time to time.

Iodoform gauze alone may be used for this purpose. It should be frequently changed, and drainage kept up for several days, according to the nature of the case.

Anæsthesia, Local and General.

Local anæsthesia has not been much employed in gynecology. It may be used for certain purposes.

Ether-freezing is not to be employed.

Ethyl-chloride, or a mixture of ethyl and methyl-chloride, acts more rapidly and with more certainty than ether. The spray is produced by the heat of the hand acting on the bulb containing the liquid. It is useful in opening a superficial abscess—*e.g.*, on the labia, in cutting away a small wart, &c.

Cocaine in solution is used either as a superficial application or injected hypodermically. The solution should contain an antiseptic.

When a mucous surface is painted, a 10 per cent. solution should be used. This may be used in dilating the uterine cavity, in curetting, and in removing small mucous polypi.

When injected hypodermically a 1 to 5 per cent. solution may be used. Half a syringeful of a 5 per cent. solution produces at the end of one or two minutes anæsthesia which will last for twenty minutes, the area affected being an inch or more in diameter; outside this is an area less anæsthetised. Abscesses and cysts of the vulva may be operated upon in this way, and small tumours may be removed.

As a rule no toxic symptoms follow the ordinary use of the drug. Some patients, however, are susceptible to the action of a small quantity. The serious symptoms are fainting, slow breathing, sickness, depression, quickened pulse. A dose of $1\frac{1}{2}$ grains may produce these symptoms. The minimum lethal dose is $7\frac{1}{2}$ grains.

Parvin highly recommends Schleich's mixture of cocaine and morphine.

It is made as follows:—

Sodium chloride, . . .	2 parts.
Hydrochlorate of morphine, .	$\frac{1}{4}$,,
Hydrochlorate of cocaine, . .	1 ,,
Water, ...	1000 ,,

To each litre of this mixture, add twenty drops of a 5 per cent. solution of carbolic acid. For injection 100 c.c. may be safely used.

General Anæsthesia.—There is still a great difference of opinion as to which drug is the most convenient or the safest to produce general anæsthesia.

An effort is being made to emphasize the dangers of chloroform, and statistics are being accumulated from reports of deaths published in the journals. Such statistics will not serve as the basis of correct generalisation, because, in some of the reported cases, death has been due to the mal-administration of the drug, not to the drug itself. Thus, if the surgeon begins his cutting too early, before the patient be well under the influence of the chloroform, and if stoppage of the heart occur reflexly as a result of the shock of the incision, the death should not be attributed to the drug.

Neither if the anæsthetist gives too much of the drug, without watching the patient carefully, should death be attributed to the drug, but to an overdose of it.

It cannot be too strongly emphasised that the anæsthetist must give his constant and untiring attention to the patient. If this were more enjoined there would be a smaller death-rate.

But it must be admitted that there are a few cases in which death may occur, in spite of extreme care and elaborate precautions.

The administration of the anæsthetic.—Beforehand the general condition of the patient must be carefully made out. No food should be allowed for four or five hours. Some administer as a routine practice a hypodermic dose of morphine ($\frac{1}{6}$ gr.) and of atropine ($\frac{1}{50}$ gr.) half-an-hour before the operation. A small dose of brandy may be given by the mouth at this time also. Morphine is especially valuable in nervous or alcoholic cases. As a result the excitement

stage of the anæsthetic is shortened, less of the anæsthetic is required, and the sensibility to pain after operation will be diminished. It must be remembered that morphine may tend to cause faintness in certain people. The atropine is valuable in that it tends to weaken the inhibitory fibres of the vagus which go to the heart; it stimulates the accelerator fibres, and it stimulates respiration.

The patient must be placed on the back. The best position is where the lower limbs are elevated somewhat. This is most favourable to the cerebral circulation. Stomach and bowels should be empty, clothing should be loose.

Artificial teeth should be removed. The face should be anointed with vaseline to prevent blistering by the anæsthetic.

Chloroform may be given on a towel, made in the shape of a cone, or on a mask. The latter is perhaps preferable, because by means of a drop-bottle the drug may be poured on the flannel constantly without removing the mask; it is also simpler to manage. Plenty of air must be given at first. The patient should not feel suffocation nor should the breathing be disturbed. As a result of chloroform administration sensation is first abolished and then reflex action. Disappearance of the latter is usually tested on the cornea and conjunctiva. Often the perineal reflex may be abolished later.

If the anæsthesia be pushed beyond this point, the nervous system becomes more interfered with, so that complete muscular flaccidity is produced. Beyond this the danger increases rapidly. It is indicated by falling back of the lower jaw and obstructed breathing. Asphyxia is produced. The epiglottis or tongue may fall back. The glottis may

close from paralysis of its muscles. Beyond this the breathing becomes difficult, then ceases. The pulse slows, becomes irregular, of low tension, and then ceases. It is evident that there has been a fall in blood pressure.

The patient must never be allowed to approach the dangerous point. Muscular flaccidity is desired, but there should be no interference with the motor mechanism of respiration and of the circulation.

The patient must be kept in such a state that not only is sensation abolished but also reflex action. One cause of death is reflex inhibition of the heart or paralysis of respiratory and vasomotor centres when reflex activity is not absent.

When, therefore, relaxation of the muscle begins, the anæsthetist should watch the respiration, not the pulse. It is very rare, indeed, that the circulation is affected before the respiration. The jaw should constantly be kept well forwards. If the tongue should in spite of this fall backwards, the head should be depressed over the end of the table. In such a position it is impossible that the epiglottis can bend back over the entrance to the larynx. Sometimes it is more convenient to draw the tongue out with a pair of forceps.

The pupils are watched by some as a guide. They indicate safety usually when contracted. Sudden dilatation is regarded as indicating danger.

Fainting may occur leading to a dangerous condition. For this condition the limbs should be elevated, the head lowered, and a hypodermic of ether given.

If respiration should cease, the head should be lowered, hypodermic injections of ether given, and systematic artificial

respiration continued. Electricity may be applied to the pneumogastric and phrenic nerves.

If, early in the administration of chloroform, the patient should show signs of nausea, the drug should be pushed. If she vomits, she should be turned on her side. If there be mucus or fluid in the pharynx it should be quickly sponged out. If solid matter should pass into the trachea, tracheotomy might be required.

Contraindications.—According to many, chloroform may be given wherever it is necessary to perform an operation under an anæsthetic. Others—*e.g.*, Kocher, prefer to use another anæsthetic when there is much hæmorrhage, or when the patient is very anæmic, the blood pressure being low, in heart disease, in emergency cases, in dental work.

Ether is given with the same precautions as chloroform. It is less pleasant to the patient than chloroform. It may be given by a special apparatus or by means of a towel covered with waterproof. A large quantity is generally required. The toxic dose is larger than that of chloroform. The early stage of excitement is longer and more marked than in the case of chloroform. To avoid this as much as possible give the drug in large amounts at first. Too much asphyxia should not be produced, however.

Contraindications.—In catarrhal conditions of the respiratory tract in which congestion and increased mucous secretion is brought about, it may, in such cases, be very dangerous to use ether.

Ether and chloroform may be combined, or, in long operations, the patient may be anæsthetised with chloroform, the ether being used to keep her under.

Prolongation of either is always to be avoided as much as

possible, because of the action on the nervous system. Some patients may die after operations because of the depressant action of the anæsthetic. Also congestion of the kidney, along with damage of the renal epithelium, is apt to be caused, so that excretion may be interfered with. This may take place with or without albuminuria. Kidney disturbance is most apt to occur in cases in which the organs were not working normally at the time of operation—*e.g.*, in cases of *myoma uteri*. It has been particularly noticed in connection with abdominal hysterectomies for this condition. In such cases also the heart is very often somewhat abnormal owing to the alteration in general blood pressure as a result of the presence of the large tumour.

There are certain stages of abdominal operations when there may be dangerous reflex phenomena in the circulatory or respiratory systems—*e.g.*, when large tumours are removed, when much fluid is withdrawn from a cyst or from the peritoneal cavity, when there is much traction upon any parts.

As regards all general anæsthetics, marked contraindications are fatty degeneration of the heart, atheroma of arteries, kidney disease, great weakness.

Unfortunately, it is not always possible to diagnose fatty heart.

Organic heart disease is no contraindication if an operation is imperative. The anæsthetic must be given in the ordinary way so that reflex activity is abolished, in order to avoid the special danger of reflex inhibition of the heart.

Nitrite of amyl can be given if there are signs of cardiac engorgement or embarrassment, and also stimulant hypodermics.

It is interesting to note some of the results of the Hyderabad Commission's investigations[1]:—

1. Respiration always failed before circulation.

2. Chloroform + asphyxia extremely dangerous for the heart.

3. Chloroform is a more powerful anæsthetic than ether.

4. Neither, combined with pure air, paralyses the heart.

5. Chloroform, with asphyxia, paralyses the heart more quickly than ether with asphyxia.

6. The risk is greatly increased by tight-lacing, because of imperfect respiration and the tendency to asphyxia.

After chloroform no food should be given for hours. The first should be weak tea or hot water, or hot water and milk. If the patient be sick after the anæsthetic, the inhalation of acetic acid or vinegar often checks the distress. A mustard leaf may be placed on the epigastrium.

[1] *Brit. Med. Journ.*, London, Nov. 21, 1891.

PART III.—OPERATIVE MEASURES.

OPERATIVE MEASURES.

Abdominal Section in General.

Preparation of the patient.—Prior to the operation, her general condition should be made as healthy and quiet as possible. A very careful examination of the various systems must be made. Where the kidneys do not work freely, as may be the case when there is a large tumour, diuretics should be prescribed. Nourishing, easily digested food, should be given, and the bowels should be kept open with daily regularity. If the patient be suffering from any condition which might interfere with the success of the case—*e.g.*, bronchitis, the operation should be postponed, unless urgent, until the patient is better.

For a week or ten days before operation the patient should rest, lying down for a few hours each day. The last two or three days she should spend entirely in bed. A record should be kept of the temperature and pulse-rate during this period.

A daily antiseptic vaginal douche should be administered. If, in the operation, the uterus is likely to be partly or wholly removed, an iodoform gauze plug may be placed in the vagina after each douche ; and on the two days before the operation the douche may be given twice *per diem*.

In the evening of the last day she should have a thorough washing in warm water. The abdomen and pudenda should

be washed with turpentine, warm water, and soft soap. Then a cloth wrung out of an antiseptic lotion—*e.g.*, iodic hydrarg. (1 in 3000) should be placed on the abdomen and enveloped in a waterproof cover. A dose of opening medicine should be given.

Early the next morning an enema should be administered, and when the bowels move, the lower gut should be washed out with warm boracic lotion. The vagina should also be douched with an antiseptic lotion.

The operation should take place in the morning. No breakfast save a cup of weak tea or water, which may be given early. It is said that if fluids be freely administered there is less danger of troublesome thirst after the operation. In any case, nothing solid is allowed, nor any milk which forms a curd.

Half an hour before the operation the patient should get a dose of brandy by the mouth, and a hypodermic of morphine and atropine.

She should wear clean stockings, a clean under-shirt, and a clean night-gown. Just before the anæsthetic is administered the nurse empties the bladder with a catheter. In hospital the patient should then be carried to a room next the operation room, where she is anæsthetised. In private the anæsthetic may be given while she is still in bed.

In the meantime the operating room has been made ready for her reception, the operator, his assistants, and nurses have made their hands and arms aseptic. If the table to be used is the ordinary flat one, it is covered with a clean blanket, on which is placed a waterproof cover and a clean sheet. On the top should be placed a circular rubber pad with a flap reaching over the side of the table.

The patient is now placed on the table, her buttocks resting on the pad. The clothes are then drawn up under her arms and a clean blanket placed over her legs. On each side of her legs should be placed a bottle of hot water, and over the blanket a clean sheet should be placed, which should be fastened around the table. Her arms should be tied to the table. The abdominal poultice is removed and the hair of the mons veneris shaved; the abdomen is carefully scrubbed with turpentine, water, and soap, the navel being thoroughly cleaned with chloroform. The surface is then soaked with a strong antiseptic lotion—*e.g.*, corrosive, 1 in 2000. It is then washed with sterilised salt solution.

Sterilised thin waterproof cloths are now placed above and below the abdominal region, and on each side of it. These are covered by sterilised towels wrung out of a weak antiseptic solution.

The operator stands on one side of the table, usually the right, and his chief assistant on the other. Another assistant, or nurse, looks after the instruments, which have been laid out in flat dishes containing sterilised salt solution or a weak solution of boracic acid. Two nurses attend to the swabs, sponges, and lotions that may be used during the operation. The swabs, sponges, and instruments are carefully counted. A number of artery forceps, a bistoury, and a pair of scissors are placed on the antiseptic towel covering the patient's legs. A swab is given to the chief assistant before the operator makes his incision.

Opening into the peritoneum.—Most operators select the middle line between the pubes and umbilicus. This incision is accompanied with least injury, for no muscle,

large nerves, or important vessels are divided. Sometimes an unclosed umbilical vein may be cut, or one or more veins in the extra-peritoneal fat. This incision may be employed for most purposes, as it affords equal access to both sides of the pelvis. This is especially valuable in cases where beforehand it is not known whether there may be a bilateral operation. If, when this incision is made, it is not sufficient even when lengthened, another incision may be made at right angles to it in order to give more access to the side.

The chief objection to the mesial incision is that the resulting cicatrix is not apt to be as strong as that following incision elsewhere.

Some operators, therefore, always make the incision to one side of the middle line. If this be vertical, it should divide the inner part of the rectus. Vertical incisions in the outer part of the rectus or outside this muscle, if of any length, are not so desirable because the nerves which supply the muscle are divided. In the upper region of the abdomen this is apt to be more serious than in the lower portion. If lateral incisions, therefore, are to be made, the large nerves will be protected if the abdominal wall be cut in an oblique or transverse line.

Transverse division of the rectus is of no importance. Strong tendinous union takes place and the contraction of the muscle is not interfered with.

The length of the incision to be made depends on the nature of the case. It is a common practice to make a small one at first, say three inches in length, and afterwards to enlarge it if necessary.

The incision is made as follows:—Let us suppose that it

is a mesial one. The skin and superficial fascia with fat are divided. Bleeding points may be caught with forceps, because all bleeding should be checked before the peritoneum is opened. Large vessels may be tied with catgut. Most of the bleeding points are, however, checked by the temporary application of the forceps. The junction of the sheaths of the recti (linea alba) is divided, then the transversalis fascia which is transversely striated. Under this lies the extra-peritoneal fat. It varies in thickness. Usually it is scanty when the superficial fat is not abundant. It should be caught up on each side of the middle line by artery forceps held by the operator and his assistant. Deeper and deeper portions should be caught and divided until at last the peritoneum is incised. These precautions are necessary in order that no damage be done to the bowels or omentum. The obliterated urachus may be found in the middle line, but it can be pushed aside. It may sometimes be unobliterated for a distance, and may contain calculous deposits, or may communicate with the bladder.

Ordinarily when the slightest hole is made in the peritoneum the bowels fall away from the surface, owing to the inrush of air. When, however, they are adherent to the parietal peritoneum, there is great risk of opening into them. In these cases if the adhesions cannot be separated, it is necessary to close the opening in the abdominal wall, and it is justifiable to endeavour to make an opening at another part. If the bowel be cut into, it should be closed by catgut sutures (Nr. 0 or Nr. 1), passed through both the serous and muscular coats, the edges being turned in towards the lumen of the bowel.

Sometimes it is difficult to recognise the peritoneum. It

may be very thin and the extra-peritoneal fat may be mistaken for the omentum. When there is much ascites it may project and be mistaken for a thin cyst wall. When there are many adhesions below, it may be mistaken for the same structure. If it be very much thickened by inflammation it may be difficult to distinguish.

As a rule the omentum is above the umbilicus. If below, it can easily be pushed aside unless adherent. If adherent it should be carefully separated from the abdominal wall, and pushed up or to one or other side. Bleeding vessels in it may be ligatured, or portions may be sutured *en masse*. Sometimes it may be necessary to cut through the omentum, tying the vessels.

Bowel adhesions, if recent, may be broken through by means of the finger or swabs. If they are of any length they may be tied in two places and divided. Sometimes they are short and strong, and cannot be touched.

If the peritoneum be successfully opened, a finger should be passed in, the bowel pushed aside, while the rest of the peritoneum is cut with a pair of scissors the full length of the wound. Two or three fingers are then introduced in order that the diseased part may be palpated. If these are not sufficient, the whole hand should be introduced, the opening being made large enough. In cases where the nature of the internal condition is uncertain—*e.g.*, intestinal obstruction, rupture of a tumour, an ectopic gestation sac, &c., it is best to make a large opening at once, four or five inches in length, in order that there may be no trouble in examining the viscera.

Before the condition can be treated it may be necessary to carry the incision above the umbilicus. In so doing it is

best not to divide the navel, but to cut to one side of it. Often, also, the incision is extended downwards nearly to the symphysis. Care should always be taken to prevent the bladder from being injured. If it be cut, the wound should be closed with a continuous catgut suture.

The treatment of the various conditions for which the abdomen is opened will be considered in succeeding chapters.

During all manipulations it is of great importance that the peritoneal cavity should be kept dry, that all fluids, clots, &c., should be prevented, as much as possible, from entering it, by means of swabs, and that the bowels should not be exposed to the air without being covered in a sterilised towel wrung out of a warm sterilised salt solution.

If the case is one in which the diseased part has been satisfactorily removed without the necessity of drainage, any small amount of blood or other fluid which has escaped among the intestines, should be wiped out with sterilised swabs held in long forceps. These should be passed especially into the pouch of Douglas, care being taken not to disturb the ligatured pedicle. The bowels must not be roughly rubbed during this procedure.

In the great majority of cases irrigation is not necessary. When pus or the contents of a ruptured cyst, or of ruptured bowel, are widely spread in the abdominal cavity, it is well to wash out the cavity with a sterilised salt solution (6 per cent.) at blood heat. The stream should flow *gently* through a rubber tube from half an inch to three-quarters of an inch in diameter. When the cavity is full the hand of the operator should be cautiously moved among the intestines. The stream should not be directed against the diaphragm, nor

should the cavity be too much distended. Dyspnœa, asphyxia, or cessation of breathing may take place if caution be not observed. After irrigation careful sponging must be carried out to remove all the fluid. Some experimenters state that it is impossible to clean the cavity thoroughly by means of irrigation, because of the distribution of the foreign material among the coils of intestines; others, that thorough sponging alone is not sufficient. Probably a combination of both methods in bad cases is best.

Sometimes a cyst cannot be removed, but must be stitched to the abdominal wound. I will describe the technique in such cases, when they are specially referred to. The method of carrying out drainage is referred to on page 202.

Closure of the abdominal wound.—Several methods are adopted. A common one is that in which several sutures are passed through the whole thickness of the walls. Before the sutures are passed, a sterilised gauze pad is placed on the intestines under the wound, in order to keep them out of the way of the needles, and to catch any blood from the stitch-holes. At this stage the assistant in charge of the instruments should see that all are in his possession and that nothing has been left in the abdomen. The nurse in charge of the swabs or sponges should likewise be able to account for all that have been used. None of these should be divided in an operation.

A number of large full-curved needles are threaded with pieces of thoroughly sterilised silk sutures or of silkworm gut, and are passed by means of Martin's needle-holder through the abdominal wall on each side of the wound, the needle passing through the skin about three-eighths of an

inch from the edge. Care must be taken that none of the layers shall retract so far as not to be pierced by the needles. They may be pulled towards the middle line by the assistant, if necessary.

The sutures are placed about half an inch from one another.

When all are passed, the pad is withdrawn from the abdomen, the edges of the wound brought together, and the sutures tightened. Care must be taken to keep intestine and omentum out of the wound. The assistant then keeps the wound closed while the operator ties the sutures; each knot should have a double turn on the first part.

All blood should be swabbed out of the wound while it is being tied. The skin-edges are next carefully approximated. If there is gaping at any point, cat-gut may be used to make closure.

The suture ends are cut short, the skin surface is dried and made ready for the dressings.

Another method preferred by many is the following:—The peritoneal edges are brought together by means of a continuous catgut suture. The rest of the wound is closed by a series of sutures passed as already described, including everything but peritoneum. This method is a good one. If suppuration starts in connection with one of the sutures it will not tend to spread to the peritoneum, which has been separately closed.

Another method is recommended by some—viz., to close the wound layer by layer by means of catgut. It is said to lead to a stronger cicatrix. There is no proof of this, however. It takes more time than either of the other methods.

The dressing.—The wound and navel are thickly covered with iodoform, naphthalene, or a mixture of both. A thin pad of sterilised gauze, or a prepared pad of wool enclosed in gauze, is placed on the wound. This is covered with a single piece of gauze, larger than the pad. The edges of the gauze are fastened to the wall with antiseptic collodion. In this way the dressing is closely fixed to the wound.

Antiseptic collodion is made as follows :—

Mix,

Absolute Alcohol,	℥iii.
Iodoform,	ʒvi.

Add,

Ether,	℥iii.

Add,

Pyroxylin until the fluid is syrupy.

Williamson recommends highly, for wounds and dressings, a celloidin mixture, *e.g.*—

Celloidin, ...	2 parts.
Absolute Alcohol, . . .	15 „
Pure Ether (Sp. Gr. 720), . .	15 „

Over the gauze, pads of dry antiseptic wool are placed. The dressings are held in position by means of a wide abdominal bandage, made of domette or of fine flannel, which has been sterilised. The patient is then placed in bed, which has been warmed with hot water bottles.

Drainage of the peritoneum.—It is well to carry out drainage when foreign matters have been present in the peritoneal cavity—*e.g.*, pus, blood, contents of the intestinal canal or bladder, cyst contents; when at the closure of the wound there is unchecked capillary oozing from the

same surface, or where the case is one in which after-hæmorrhage is to be feared.

In the great majority of cases a glass tube suffices for drainage. I have already described it and the other methods of drainage, *vide* p. 137. The tube is usually placed in the pouch of Douglas, passing between a couple of sutures, close to the lower end of the wound. The outer end of the tube should possess a circular flange. This should not project much beyond the skin.

If the tube be too short, or have no circular flange, it may slip into the abdomen; if too long it is apt to be forced inwards upon the viscera. Damage—*e.g.*, perforation of the bowel wall, may be caused in this way.

The sutures are all tied, except one next the tube, which is left to be tied when the tube is withdrawn. The skin edges around the tube may be kept from gaping by catgut sutures.

The dressings in such a case are best applied as follows:—A square piece of thin india-rubber sheeting is perforated and fastened to the tube just below the flange. Under it the antiseptic powder and pads are placed. In this way any fluid escaping from the tube does not soak the dressings next the wound. Over the tube-mouth a pad may be placed, and the whole covered with absorbent wool, and kept in position by means of an abdominal binder. This must not be fastened tightly.

The tube may be continuously drained by sterilised gauze or lamp-wick passed into the tube. Generally it is best to withdraw the fluid by means of a syringe with a rubber tube attached, as often as is necessary.

Sometimes immediately after an operation it may require

to be drawn off every ten or fifteen minutes. The intervals should be made as long as possible. When capillary drainage is established it is apt to be stopped by clots if the discharge be bloody.

If the syringe will not remove them, a sound with cotton-wool on the end may be used.

If the tube be left in position for twenty or thirty hours or more it tends to become enclosed in peritonitic adhesions. This is sometimes valuable where there has been a tear in the rectum in the removal of a mass from the pouch of Douglas, which has not been well closed during the operation. The fæcal matter and gas escape through the tube-track without infecting the general peritoneal cavity. This fæcal fistula may last a long time.

When intestine has been wounded, gas or fæcal matter may pass from the tube, and this may be the first intimation that the accident has taken place.

Sometimes air only may escape. This has entered during the operation or has been sucked in during attacks of vomiting.

If the holes in the side of the tube are larger than one millimetre, the omentum or even the bowel may tend to work its way into the lumen. A series of little herniæ may thus form, which, becoming strangulated, may give rise to pain, vomiting, local hæmorrhage, and gangrene. This may occur within the first twenty hours of the operation. To prevent it, the tube should be turned around and moved slightly upwards and downwards each time the fluid is removed.

If the tube should become fixed by the formation of the herniæ, rotation may cause the withdrawal of them. But it

may be necessary to pull up the tube, ligature the omentum just outside the tube, and cut off the hernial portion.

The drainage tube may only be required for a few hours, but it may be needed for several days. It should be removed when the discharge is becoming scanty.

The longer the tube remains in position the greater the risk of an abdominal hernia. The edges of the tube-track are slow in healing.

The tube should be of strong glass. Otherwise it might be broken during an attack of vomiting.

When it is withdrawn, the suture that was left untied is securely fastened and the whole wound is freshly dressed.

I have already described the plan of draining the peritoneum by means of a large gauze pack.

Martin and others often drain the peritoneum by means of a T-shaped tube passed through an opening from the pouch of Douglas into the vagina, which is made at the abdominal section. The tube is carried up the vagina and into the peritoneum by means of forceps, the cervix being steadied at the time by an assistant. The vagina and uterine cavity should be made aseptic before this is carried out. The lower end should be surrounded with iodoform gauze, which must be changed from day to day.

After-treatment of abdominal sections.—The patient lies at rest on her back. For the first twenty-four or thirty-six hours nothing should be given by the mouth, except where the patient is very young, old, or exhausted. If it be necessary to feed early it is best to do so by the bowel. With some the rule is to give nothing until flatus is passed

by the rectum. If the patient be doing well and be not sick on the evening of the second day, a little milk and hot water or milk with lime-water may be given in sips. On the third day, the same may be given in the morning and evening; on the fourth day, milk and water may be given in the morning, weak tea with milk in the afternoon, chicken or beef-jelly, gruel or arrowroot in the evening. During the night one or other of the same articles may be given. On the fifth day, beef-tea, chicken-tea, milk-pudding may be added; on the sixth day, fish; on the seventh and succeeding two or three days chicken may be added to the dietary.

There may be nausea after the operation; it may last for twelve, eighteen, or twenty-four hours, or may be more prolonged. If prolonged, the administration of food by the mouth must be postponed.

For the nausea and vomiting, nothing should be given for some hours. Then bismuth and hydrocyanic acid mixture may be tried, sips of champagne, or sodium bicarbonate dissolved in hot water (5 grains to ℥i) given in the dose of a couple of tablespoonfuls. Also a mustard leaf over the epigastrium may give relief.

In bad cases sometimes a hypodermic of morphine will check the vomiting. The head should not be much higher than the body in such cases.

In long-continued vomiting, where the patient is weak and requires food and stimulant, nutrient enemata may be given. The following is a good mixture:—

Peptonised milk, . . ℥i)
Brandy, ... ℥i)
The whites of two eggs; add a little salt.

Or a mixture of peptonised beef-tea with brandy may be given. If necessary, strophanthus or digitalis may be added to these.

Nutrient suppositories are also used.

Before nutrient enemata are given it is well to wash out the rectum with warm salt solution. No ice should be given. Cold black coffee is often well borne.

As regards the bowels, nothing passes save flatus for some days. If gas tends to collect and cause the patient any annoyance, a rectal tube should be passed to enable the flatus to escape.

If all goes well, on the evening of the fourth day a saline aperient should be given (earlier if there is much distension and trouble). If there is nausea, however, it is best to produce an evacuation on the morning of the fourth day (or earlier) by an enema of soap and water (1 pint), to which may be added if desired, an ounce of Epsom salts, or this may be preceded, an hour before, by warmed olive oil or glycerine (6 ounces).

On succeeding days, cascara by the mouth, or glycerine suppositories by the rectum, may suffice to keep the bowels regular.

After the first opening of the bowels, the patient sometimes feels weak. For this condition a nutrient enema, with brandy, is valuable.

The patient is generally greatly troubled with thirst. She must be encouraged to restrain the desire to drink, and must not be allowed to take fluid by the mouth. She may rinse out the mouth or suck a rag dipped in water and get relief. Sometimes an enema of warm water may help the patient.

The bladder should not be emptied with a catheter unless absolutely necessary. During the evening after operation, the patient should try to pass water. If she is not able she should again try during the night. A warm cloth over the vulva may assist her. If she fail, the nurse should draw off the urine under strict antiseptic precautions. This may be repeated every six hours, if necessary.

Pain is generally felt in the pelvis after sections. It varies greatly in intensity in different cases, is not dependent upon the seriousness of operation, and has a good deal to do with temperament. It generally begins to improve after twenty hours or thereabouts, and passes off, usually, within the next twenty-four hours.

The ordinary cause of pain is constriction of the pedicle, and also of the abdominal wall by the wound-sutures. It is aggravated by vomiting. Other pains may be due to stitch abscess, to blood extravasation, to neuralgic conditions in weakly women, and sometimes to peritonitis. It must be remembered that there may be little or no pain with the septic peritonitis following an abdominal section.

For pain nothing should be given if possible. The patient should be encouraged to fight against it. Sometimes morphine may be required. Where the person has been accustomed to this drug it will probably be of little service.

Restlessness is a common condition. For this the nurse must try to arrange the pillows and bed-clothes so as to give the patient more comfort. Sponging of the limbs and chest with warm alcohol, or with warm soap and water, may be tried after the second day, if the patient be not too ill or restless. After each part is sponged it should be dried and covered. There should be no exposure leading to a

chill. This may be regularly carried out during convalescence. Excessive restlessness may, however, require a hypodermic of morphine or an enema of sodium bromide (ʒi), or of paraldehyde (ʒii), in syrup and water.

The pulse, after operation, if the case proceeds well, is slow and regular. It may be quickened by internal hæmorrhage, peritonitis, and various other conditions—*e.g.*, restlessness, temper, nervous temperament, &c.

The temperature, in an ordinary case, usually rises in the evening of the day of operation, and afterwards gradually falls to the normal, where it remains. It may be subnormal where there has been much shock or depression, or where marked internal hæmorrhage has occurred. It may be elevated by various conditions—*e.g.*, disturbed stomach, tympanites, nervousness, inflammation, formation of a hæmatoma or hæmatocele, &c. There may be marked rises of the temperature with peritonitis, though in some cases it may be normal or subnormal.

The tongue should in good cases be moist, free from coating, and of normal colour. It may be coated from a disordered stomach, or may be stained light brown from bilious vomiting. In peritonitis it has various appearances. It may be covered with a yellowish coating, or may be rough and dry. Where suppuration is going on to any extent, it may be dry, smooth, and of a bright red colour.

The occurrence of tympanites must be watched for carefully. It causes colic, pain and distress, and may quicken pulse and breathing, interfering with the action of heart and lungs. It may be due to intestinal disorders or to peritonitis. Distension is very often the earliest indication of peritonitis, and, in such a condition, usually appears on the

third day. Tympanites may follow the removal of large tumours, but this form is usually painless. The rectal tube should be used to draw off the flatus, or an enema containing :—

Warm water, 1 pint.
Warm olive oil, 2 ounces.
Turpentine, 1 tablespoonful.

A turpentine stupe on the abdomen may also be tried.

The stitches should not be removed from the abdominal wall until the bowels have been moved. A dose of an aperient should be given on the evening previous to the day of their removal, so that there may be a motion in the morning before the stitches are taken away.

On the morning of this day it is also a convenient time to change the patient's night-dress and the bed-linen, because after removal of the stitches, it is necessary that she should be kept very quiet. This changing must be carefully carried out.

Ordinarily the stitches may be removed on the eighth day. If a drainage tube has been employed, so that one stitch is later than the others, all may be removed save this one, or all may be left until the tenth day.

Before removing the sutures, the line of the wound and the suture ends are carefully washed in an antiseptic lotion. Each stitch is removed by means of a pair of forceps and a pair of scissors. The knot is pulled outwards, the skin depressed a little by the scissors, the suture cut below the skin-level and drawn out of the wall by the forceps which are attached to the knot.

Antiseptic powder is then sprinkled along the line of the incision. This is covered with a narrow piece of wool.

Across this are placed strips of perforated adhesive plaster, the abdominal walls being well drawn towards the middle line by an assistant before the plaster is applied.

If no suppuration occur, this dressing may not require to be changed for some time.

By the fifteenth or sixteenth day, the patient may be allowed to sit up somewhat in bed, being propped up with pillows. After two or three days, if all goes well, she may be allowed to sit up in a chair for a little, and, on the following days, to walk a little. Before being allowed up, she should be fitted with an abdominal belt which should be worn constantly, a light one at night, a strong one by day.

During the fourth week the patient may go home. She must be told to avoid all exertion, to be careful with her diet, to keep the bowels regular, to avoid coitus for four months, and to wear the belt for a couple of years. After six months she need not wear a night-belt.

Complications after Operation.—*Shock.*—After most cases of abdominal section there is some depression, the patient being pale, the pulse small, soft, increased in frequency (sometimes slow). Sometimes shock is a very marked feature. It is generally due to lengthened anæsthesia, hæmorrhage, reduction of temperature, especially from the exposed peritoneum, irritation of the peritoneum during the manipulations, or as a result of pouring large quantities of fluid into the abdomen. The dangerous element in shock is the failure of the heart's action. Death may occur during the first, second, or third day.

It is most to be expected in old, weak, or anæmic women.

Hæmorrhage.—Internal hæmorrhage may be due to various causes. The most common causes of severe bleed-

ing are slipping of the pedicle-ligature, loosening of it, and retraction or shrinkage of some part of the pedicle. In most cases such a calamity occurs on the first or second day, though it may be later. It may be associated with the straining of vomiting or coughing.

Hæmorrhage also may take place from torn adhesions. In all these cases it is intra-peritoneal. Sometimes extra-peritoneal bleeding may occur—*e.g.*, in the broad ligament. This may sometimes force the ligature from the pedicle, and may burst into the peritoneal cavity. Hæmorrhage may also occur in connection with the abdominal wound when the patient has hæmophilia, leucocythæmia, bad jaundice or purpura.

If a drainage-tube has been used, the internal hæmorrhage may soon be detected. If not, the symptoms and physical signs indicate the condition. The pulse becomes rapid and thready, the temperature falls, the face gets pale and waxy. Respiration increases. Patient is thirsty, restless, and pants for air. She may faint, may see everything darkly, or may see dark spots before her eyes. She feels giddy. If the case has a fatal issue she gets collapsed, pupils dilate, pulse gets unrecognisable, temperature falls, and limbs become cold. On bi-manual or abdominal examination a boggy, indefinite fulness may be made out—dull on percussion in the flanks. If the blood is extra-peritoneal, its circumscribed and unilateral position may be determined.

In all cases, as soon as hæmorrhage is suspected, if no drainage-tube has been used, remove a stitch or two near the lower end of the wound, and pass a tube deeply into the pelvis in order to determine the presence of blood.

When hæmorrhage is detected, the abdominal wound should be re-opened, and the source of hæmorrhage found.

If the pedicle has slipped it should be caught up and re-ligatured. If this be impossible, hold the raw edges by forceps, ligature the ovarian, and, if possible, the uterine artery of the bleeding side. The raw edges should then be closed with continuous catgut suture. The blood is then washed out of the peritoneal cavity. Sterilised salt-solution should be used, some of it being left in the cavity to be absorbed into the system, thus serving instead of transfusion.

When oozing goes on from adhesions, the drainage-tube being left in the wound, it is well to apply a compress to the abdomen, taking care not to put pressure on the tube. Wool is placed on the abdomen, thick cloths on each side, and an elastic binder over all. A firm vaginal plug may be introduced. In bad cases the abdominal wound must be re-opened, and the operator must endeavour to check the bleeding by cautery, ligatures, or pressure.

In cases of bleeding from a large raw surface, packing of the cavity with iodoform gauze may be tried.

When the hæmorrhage is extra-peritoneal, ice-bags may be applied to the abdomen, and ergot given internally.

In all of these conditions the general treatment of hæmorrhage may require to be carried out—*e.g.*, stimulants internally or hypodermically, warmth, bandaging of limbs, rectal injection of warm solution of salt (ʒi to Oi).

Sepsis.—Most of the deaths in the first week are due to sepsis. Some cases, in which the cause is put down as heart-failure, are undoubtedly due to septicæmia.

Examination of the blood or of the peritoneum, though there may be no peritonitis, may reveal germs. The septic attack may be acute, and death may be sudden, or a more chronic process may be set up. Peritonitis may or may not be present. It is often widespread.

The septic process often begins on the first day. Temperature rises, but this varies considerably in different cases. There may be rigors. Pulse increases markedly. The worse the case, the more marked the difference between pulse and temperature. Vomiting is often bad. The patient becomes exhausted. Face is peaked and anxious.

When septic peritonitis is present, the symptoms usually develop first on the third day. Tympanites develops, and tenderness on pressure. If the patient feels pains, they are not often severe, and may disappear after a few days. The vomiting may be bad, but may vanish. Pulse gets soft and quick. The temperature varies greatly. Patient is weak. Face is anxious. Eyes appear sunken with dark rings around them. The intellect is generally quite clear. Tongue gets dry and brownish.

Treatment.—An enema of warm soap-suds (Oss.), turpentine (℥ss.) and castor oil (℥i), or sulphate of magnesia (℥i) should be given, and at intervals of four or five hours, a simple turpentine enema should be administered. The rectal tube may be passed at intervals. It is a good sign when flatus passes.

By the mouth calomel and salines should be given alternately in order that purging may be produced.

No morphia is to be given, unless the patient be beyond recovery. Brandy and champagne are to be given by the mouth or in nutrient enemata.

The abdomen is not to be opened, save where there is evidently a collection of pus in it.

If there be extra-peritoneal pus it may be opened through the vagina or elsewhere.

Local inflammations.—A localised peritonitis in the pelvis may take place, probably due to the irritation of some foreign body, solid or fluid. Adhesions form, and the inflammation does not become general.

Also, localised cellulitic inflammations may occur. It must also be remembered that blood-collections may break down and suppurate.

When these cases go on to pus formation, the pus tends to burrow, and to escape either into the peritoneal cavity, bowel, bladder, vagina, or through the abdominal wall.

Thrombosis may occur in neighbouring vessels, and pyæmia or embolism may result.

The clinical symptoms are pain, sweating, rigors, rises of temperature, headache, nausea or vomiting. After a time hectic develops.

These inflammations in their early stages may be treated by purging, blistering, and the hot douche. When pus forms it may be removed, and the cavity drained, if possible, *per vaginam.*

Inflammation may also occur around the stitches in the abdominal wall. The great cause is imperfect asepsis. The inflammation ends in pus formation—stitch-abscess. In such cases the suture affected must be removed, and, if necessary, the openings enlarged so as to allow of free outward drainage and washing-out with antiseptics.

Opening of the abdominal wound.—This may occur before the stitches are removed, if they be not of good material,

and if there be any great strain on them—*e.g.*, coughing. Generally it occurs after they are removed too early, because of imperfect strapping or because of increased intra-abdominal pressure. Sepsis in the wound is also a cause of weakening of the wall. The wound must in such cases be closed, the wound and bowels being carefully washed if suppuration be present, and a drainage-tube inserted into the peritoneal cavity.

Intestinal obstruction.—This accident may occur after abdominal section. It may be due to an adhesion of the bowel and pedicle; to the incarceration of a loop of gut between the pedicle and some other part, when the former has been fastened to the abdominal wound; to twisting of the gut during the operation; to the inclusion of gut in the abdominal wound; to the passage of a suture through bowel; to adhesion of bowel and abdominal cicatrix; to constriction by a hæmatoma of the broad ligament; to atony of the bowel wall and tympanites; to the same condition in peritonitis; to matting together of the bowels in chronic peritonitis. The obstruction may occur soon after the operation or not for months. The treatment is to do abdominal section and relieve the obstruction.

Tetanus.—This occurs in a certain percentage of cases. According to Olshausen, it has occurred in cases in which the clamp has been used, in those in which the pedicle was treated extra-peritoneally by means of perforating needles or the wire *serre nœud*, and also in cases where the pedicle was ligatured and treated by the intra-peritoneal method. The tetanus is probably related to imperfect ligature of the pedicle, whereby the nerves were not thoroughly compressed, but left in an irritable state.

The treatment is that of tetanus in general. Locally it may be necessary to tighten the constricting band, or to remove it, along with the perforating needles. Sometimes excision of part of the end of the stump may be required.

Perforation of bowel.—This may be due to a cut at the time of operation, to a tear made in separating adhesions, to the giving way of a stitch after an operation on the bowel wall. It may follow intestinal obstruction. It may result from the bursting of pus into the bowel; from the pressure of a drainage-tube, or the irritation of a ligature. It may be due to malignant disease, or may follow opening of the abdomen for tuberculosis, due to the giving way of a tubercular ulcer.

Treatment.—When the gut is wounded in operations, it should be closed with Lembert sutures. In the case of a diseased wall or a large tear, it is best to sew the opening to the edges of the abdominal incision. When the opening occurs in the rectum in the pouch of Douglas, if possible it should be closed with sutures on the peritoneal side. If this cannot be done, a large drainage-tube, passed out of the abdominal wound, may be employed. Little food, no purgatives, and no enemata should be given.

Some use a plug of iodoform gauze for a few days. In addition, a colotomy may be performed in order to prevent fæces passing down the rectum. When a fæcal fistula forms it should be dressed carefully. After it has existed for a time its closure should be attempted.

Ventral hernia.—This may result from careless closure of the wound—*i.e.*, from not bringing towards the middle line all the elements in the edges of the wound; carelessness on the part of the patient in regard to the wearing of her belt; over-exertion—*e.g.*, straining at stool, lifting, coughing, or

vomiting. It is more common after hysterectomy than after other forms of abdominal section. The use of the drainage tube, or suppuration in the wall, tends to lead to a weakening in the wound, which may be followed by hernia.

The treatment is to open the abdomen, excise the old cicatrix, and to close the wound layer by layer.

Parotitis.—This may occur on one or both sides. As a rule it develops from five to seven days after operation. It may be associated with sepsis. There is pain locally and elevation of temperature. The swelling may subside or suppurate.

Vaginal Section or Colpotomy.

Recently several gynecologists, notably Martin of Berlin, have recommended the treatment of various diseased pelvic conditions by means of an opening into the peritoneal cavity made through the anterior fornix of the vagina, instead of one made through the abdominal wall. It is claimed that the operation is a safer one for the woman, and not attended with the after troubles or dangers associated with abdominal section.

The operations which may be carried out by this method are :—

1. Removal of myomata not larger than a fœtal head.
2. Removal of small ovarian tumours.
3. Ovarian resection and destruction of small cysts.
4. Removal of inflamed tubes and ovaries, pyo-salpinx, hydro-salpinx, hæmato-salpinx.
5. Removal of early tubal pregnancy.
6. Vaginal fixation of a retroverted uterus.
7. Breaking of peritonitic adhesions to uterus, except those deep in the pouch of Douglas.

Preparation for the operation.—The patient is prepared in the careful manner already detailed on page 149. Strict asepsis is aimed at throughout the operation.

The operation.—The patient is placed in the lithotomy position and anæsthetised. The hair of the vulvar region is shaved, and the genital tract, the vulva, and the buttocks are made aseptic. The patient's legs should be covered with long sterilised linen stockings. During the operation irrigation of the wound should be carried out with hot sterilised salt solution.

First, a short broad-bladed spatular speculum is introduced into the vagina to pull back the posterior wall. Orthmann's combined sound and volsella is then used to steady the uterus; the sound enters the uterus, and the volsella grasps the anterior lip of the cervix. If the sound cannot be passed, an ordinary volsella must be used. The uterus is then pulled downwards and backwards. With another volsella the anterior vaginal wall is held near the urethral orifice. A vertical mesial incision is then made through the anterior vaginal wall, and is carried on the cervix. On each side of this line the wall is separated from the bladder and cervical musculature. The bladder is then separated from the cervix as far up as the peritoneal reflection.

This layer is caught with forceps and carefully opened. There is usually little hæmorrhage. Bleeding points may be twisted or tied with catgut. When the peritoneal opening is fully made, the pelvis is explored with the fingers. Small adhesions may be broken with the fingers. Larger ones may be ligatured and divided if they are within access. The diseased condition is then attended to. If parts are to be

removed — *e.g.*, inflamed ovaries — the pedicle is treated exactly as in cases of abdominal section.

Method of closure of the incision.—With Martin's full-curved needle, catgut sutures (No. 3) are passed through the upper part of the vaginal wound, cellular tissue at base of bladder, peritoneum, and anterior wall of the cervix. These are then tied in the vagina. With continuous catgut the rest of the vaginal wound is completely closed. Care must be taken not to injure the ureters. Martin passes the sutures through the anterior wall of the body of the uterus, in order to bring about a vaginal fixation of the uterus. This plan must not be carried out if there is a chance of pregnancy succeeding. There is risk of danger in the labour.

After-treatment.—The patient is kept at rest in bed, the same rules to be observed that are followed in abdominal section. The urine is not to be drawn off unless necessary. Iodoform pessaries may be introduced into the vagina from time to time.

On the fifteenth or sixteenth day usually the patient may be allowed to sit up. From this time onwards the vagina should be carefully douched daily for two or three weeks with a sublimate solution (1 in 3000).

In women who do not possess a roomy vagina this operation should not be attempted—*e.g.*, virgins.

Some operators prefer to open the peritoneum through the posterior fornix.

Affections of the Peritoneum and Cellular Tissue.

Peritonitis.—At present it is impossible to define accurately the limits of the medical and operative treatment of peritonitis.

Acute local pelvic peritonitis forming serous effusions.—In most cases these do not require to be operated upon. When they cause trouble by their pressure, and are slow in absorbing, they may be aspirated through the vagina. This should be done after the genital tract has been made aseptic. After the aspiration, the vagina should be packed with iodoform gauze.

Localised purulent effusions resulting from septic peritonitis.—These must be operated upon if possible. The vaginal opening is to be preferred, but it may be necessary to cut through the abdominal wall. The cavity may be drained with a large rubber tube or iodoform gauze. If the opening be vaginal, iodoform gauze is placed in the vagina; if abdominal, antiseptic wool dressing is used over the opening. After twenty-four hours, irrigation of the cavity may be carried out twice daily, iodoform emulsion being introduced each time.

In such cases the result is generally successful.

General diffused acute peritonitis, non-tubercular, with sero-purulent or purulent fluid, large or small in quantity.—The peritoneum is opened. If the cause of the inflammation be found—*e.g.*, gangrenous hernia, appendicitis, perforation of bowel, &c., it should be attended to. The cavity should be thoroughly irrigated in the manner described on page 155, and then drained. It must be remembered that the most thorough irrigation may not remove all pus from the cavity. Small portions are apt to get caught among folds of bowel.

When there is much plastic peritonitis binding the intestines together, it may be necessary to tear through a considerable number of adhesions in order to seek for the cause of the inflammation, and bleeding may be started.

If the cause in such cases be a perforation, it is generally best not to interfere with the adhesions, for they may be in process of closing the opening; all that should be done is to wash out free pus and loose debris.

Subacute and chronic tubercular peritonitis.—In cases of tubercular peritonitis where there is a quantity of ascitic serous fluid, the peritoneum should be opened by the ordinary incision, the fluid completely removed, and the wound again closed. Such a procedure is generally followed by cure. When the fluid is purulent the cavity should be drained by a tube for two days. If it be continued for a longer period a sinus is apt to remain, or a fæcal fistula may be formed by the pressure of the tube on a piece of bowel.

When an encysted collection of fluid exists, it should be opened into directly and the fluid removed.

In cases where matting of bowels and adhesions are most prominent, there being little or no fluid, the results of opening into the peritoneum are not so satisfactory, though undoubted benefit may be obtained in some cases. Great care must be exercised in order that the bowel be not opened. If, owing to adhesions, it be impossible to cut into the peritoneum by one incision, others should be made in the hope of finding a place where no bad adhesions exist. It is well to bear in mind that the adhesions are always most marked below the umbilicus. A drainage-tube should not be introduced among matted coils of gut.

These operations should not be carried out when acute miliary tuberculosis or very advanced tubercular disease exists in other organs of the body.

Peritonitis and ascites associated with visceral malignant disease.—Sometimes abdominal section is performed on the chance of removing the disease.

Where the ascites is troublesome, the abdomen should be aspirated from time to time.

If obstruction of the bowel occurs, it is advisable to make an artificial opening into the gut above the obstruction, if possible.

Peritonitic adhesions, producing displacement of the uterus.—Schultze recommends breaking down by manual manipulation. Recently, anterior colpotomy has been employed. By this method all adhesions may be broken through, save those which are low down in the pouch of Douglas. After the peritoneum is opened, the uterus is pulled down by successive pairs of forceps, while the adhesions are broken with the fingers or ligatured and divided.

Inflammatory deposits in the cellular tissue due to infection from the genital tract, rectum, or bladder.—Many cellulitic deposits result from infection entering the tissues through a diseased endometrium. Besides the ordinary treatment for cellulitis in such cases, it is of the greatest value to curette the uterus early, and to apply iodised phenol to the rawed surface. This should be followed by the application of tampons and antiseptic douches to the vaginal cavity.

When it is due to diseased conditions in bladder and rectum—*e.g.*, ulceration, these should be treated.

Cellulitis followed by suppuration.—When collections of pus form they should be opened if possible.

Pus may be found in various places. It may be at

the side of the uterus bulging downwards towards the lateral fornix. It may be found in the iliac fossa, and may pass below Poupart's ligament. It may occur in the vaginal region, in the perineum, at the side of the bladder, alongside the rectum, in the buttock, in the lumbar region, and between the uterus and bladder.

Whenever, in such cases, it is possible to open into these cavities without injuring the ureter, large vessels, viscera, or the peritoneal cavity, the pus should be removed, the opening being made through the skin or vaginal surface.

Sometimes it is sufficient to aspirate the collection when it is small.

A large collection should be opened freely.

Whenever there are important structures which might be injured by a knife, a director should be pushed into the abscess after an opening is made through the skin or vaginal mucosa. The opening is then enlarged with dressing forceps. In other cases the abscess may be freely opened with a knife. If a finger can be introduced, any septa or masses preventing free escape of the pus may be broken down.

Drainage should be continued by means of iodoform gauze, or by a rubber tube, after the cavity has been washed out by an antiseptic lotion.

The cavity should be washed out once or twice each day.

When the opening is made high up the vagina, it is a good plan to stitch the tube to the edges of the opening for a time.

When it is impossible to open a collection of pus seated close to the rectum by means of the vaginal incision, it should be opened by way of the gut without hesitation, the

rectum being carefully cleaned out beforehand. A large opening should be made, vessels being avoided. It should be washed out three or four times daily, and should be made to close from the bottom. The opening should be kept large by the finger, in order that it may be the last to close. If the sphincters of the anus be paralysed for a few days, the cavity drains best.

When a pus collection has discharged into the vagina, and healing takes place slowly, the opening should be enlarged, and drainage kept up.

If an abscess has opened into the rectum, the opening should be enlarged, and all pockets destroyed.

After opening has taken place into the bladder, an effort should be made to open into the abscess cavity between the bladder and cervix, and to establish drainage.

If this be not possible, it may be necessary to make a vesico-vaginal fistula, and to dilate the opening by which the pus has entered the bladder.

Some large collections of pus in the cellular tissue cannot be opened without the performance of an abdominal section.—The peritoneal cavity is opened and the pus is aspirated. The walls of the sac are then stitched to the edges of the abdominal wound. The opening into the sac is next enlarged, the cavity washed out with an antiseptic, and then stuffed with iodoform gauze. In two or three days it is removed, and a smaller quantity introduced.

Sometimes on opening the peritoneum it is found that, owing to the fixation of the pus collection, its deep-seatedness in the pelvis, or its adhesion to intestines, it is impossible to attach its covering to the edges of the abdominal wound. In such a case a careful examination

per vaginam should be made, in order to determine the possibility of draining the pus by a vaginal puncture. If this can be done, a T-shaped drainage tube should be introduced into the abscess cavity by way of the vagina. The abdominal wound is then closed.

When an opening by way of the vagina cannot be made, the abscess may be opened, carefully cleaned and drained through the abdominal wound by Mikulicz's iodoform gauze tampon (*vide* p. 137).

Hæmorrhage into the peritoneal cavity (Hæmatocele).—The exact position of surgical procedure in recent cases of hæmatocele has not been definitely fixed. The reason of this is our uncertainty in regard to all the causes which may give rise to the condition. Within recent years recognition of the importance of rupture of an ectopic pregnancy as a cause has led to early active interference. It is extremely likely that, in the future, similar measures will be adopted in all cases of intra-peritoneal hæmorrhage, whether the cause be known to be ruptured ectopic gestation or not, unless it be of such a nature as to preclude the possibility of remedial surgical interference—*e.g.*, rupture of a large aneurism.

The course to be taken is the following:—The peritoneal cavity is opened, and the bleeding point found and controlled. If the case be one of ectopic gestation, the procedure varies, according to the condition found (considered on p. 280). Should there be a rupture of the broad ligament, the bleeding vessels must be thoroughly secured with strong catgut ligatures. If the alimentary canal be ruptured, the treatment should be carried out as recommended in surgical treatises. In all cases the blood is to

be thoroughly removed from the peritoneal cavity, which should be irrigated with salt solution, some of which may be left to be absorbed by the peritoneum to make up for the loss of blood. In some cases drainage may be carried out, especially where matter other than blood has entered the peritoneal cavity, where there is difficulty in removing all the blood, or where there is some fear that the blood is not perfectly aseptic.

Hæmatocele of some duration in which suppuration has occurred.—The treatment is to open into the mass, remove the pus, break down the clot, wash out the cavity with an antiseptic, and drain it freely. The place of opening in such a case must depend on circumstances. The operator must be guided by the position and extent of the pus, by the direction in which it is tending to point, by the relationship of the intestines, and by the necessity of selecting the best track for drainage.

There can be no doubt that the vaginal opening is the best when most of the blood mass is broken down and can be removed; when the mass is of small size it affords the best means of drainage. Some, however, prefer in these cases to make the opening in the abdominal wall. It is probably best to remove the fluid by an abdominal opening and to drain afterwards by a vaginal opening, the former being closed.

When the blood mass is large and not much broken-down, the incision should be in the abdominal wall, if possible directly over the pus collection. As much of the mass as will easily come away should be removed and the cavity packed with iodoform gauze. In all these cases care must be taken not to injure the intestines. They are

generally matted together to form the upper boundary of the hæmatocele which is thus shut off from the rest of the peritoneal cavity.

Hæmorrhage into the broad ligament (Hæmatoma).—In such a case surgical interference is not necessary save when the condition is one of extra-peritoneal rupture of an ectopic pregnancy in which the fœtus has not been destroyed. The treatment adopted in such a case is given on p. 283.

Hæmatoma followed by secondary rupture into the peritoneal cavity giving rise to a hæmatocele.—Here it is best to open into the peritoneal cavity from which all blood is washed out, to stitch the edges of the ruptured sac to the abdominal wound, or, if this be not possible, to close the rent with continuous catgut. The ovarian artery should then be ligatured in the outer part of the broad ligament on the bleeding side, and, if possible, the uterine artery also. The top of the blood sac should then be carefully sutured to the abdominal wound. The sac should be opened, the blood clot removed, and antiseptic gauze packed in its place. This should be changed and lessened in amount every few days.

Hæmatoma in which suppuration has occurred.—This should be treated as a case of pelvic abscess (*vide* p. 179).

Cystic tumours of the broad ligament.—The treatment of these will be considered along with tumours of the ovary and Fallopian tubes.

Solid tumours of the broad ligament.—These are fibroma, fibro-myoma, lipoma, phleboliths, carcinoma, sarcoma, tuberculosis.

The latter three conditions are practically beyond surgical treatment. The other forms are only to be removed when

they are growing rapidly, when they are causing pressure symptoms, or when they are apt to be a cause of obstruction in future labours.

The most satisfactory method of operating is by abdominal section. The peritoneum is opened. In these cases the lateral incision may be used. The ovarian artery in the outer part of the broad ligament is tied. An incision is made through the anterior peritoneal covering of the tumour—*i.e.*, the layer of the broad ligament. The tumour is shelled out by means of the hand and removed. If there is much bleeding from the interior of the sac, the uterine artery on the same side is ligatured.

The sac may be treated in either of two ways, of which I recommend the first.

The two layers are brought together from below upwards by means of a continuous catgut suture. When this is done, the broad ligament appears on the side occupied by the tumour, as a thickened crumpled mass at the side of the uterus.

Or the edges of the sac may be stitched to the abdominal wound, packed with antiseptic gauze, and thus drained.

Hydrocele in the groin or in the labium majus.—Whether or not these arise from the unobliterated canal of Nuck or not, the most satisfactory treatment is to cut down upon the cyst and dissect it out, closing the wound with continuous catgut suture.

If the cyst communicate by an unobliterated passage with the peritoneum by means of the inguinal canal, it is well, after dissecting out the sac, to place a ligature immediately above it in order to close the passage in the inguinal canal. The wound is then to be closed with continuous catgut.

Solid tumours of the round ligament.—Fibroma, fibro-myoma, fibro-myxoma, and sarcoma may occur within the peritoneal cavity, in the inguinal canal, in the labia majora.

The latter are the most common. The extra-peritoneal forms may be removed by external incisions in the groin, unless too great extension into the neighbouring pelvic connective tissue has taken place. The intra-peritoneal forms may be removed unless they have spread too far, by means of an abdominal incision.

Retro-peritoneal tumours in the pelvis or lumbar regions.—These may sometimes be removed by abdominal section if they are not too large or malignant. Their peritoneal covering should be incised and the tumour shelled out, care being taken to avoid injuring important nerves, vessels or the ureter. Bleeding points should be tied, the peritoneal flaps, which covered the tumour, being brought together save at the lowest point. Drainage of the peritoneal cavity should be kept up for a day or two.

Tumours in the pelvic connective tissue, elsewhere than in the broad and round ligaments.—Dermoid cysts, fibroma, fibro-myoma, and sarcoma may be found—*e.g.*, in the recto-vaginal septum, at the side of the rectum, &c.

In some cases these can be removed by incisions made externally.

Affections of the Fallopian Tubes.

Non-cystic salpingitis.—As salpingitis usually co-exists with ovaritis on the corresponding side, both tube and ovary are removed, if the operative treatment is necessary. The operation is therefore named Oöphoro-salpingotomy. It is

generally carried out by means of abdominal section. Recently the method of vaginal section or colpotomy has been highly recommended by Martin.

(*a*) *By abdominal section.*—The general technique has already been described (p. 147). The abdominal incision is made, three or four inches in length, between the umbilicus and pubes, in the middle line or slightly to one side. The operator then introduces a couple of fingers, finds the fundus uteri, passes them outwards on each side to examine the condition of the appendages.

If no adhesions exist, the diseased tube and ovary are raised to the abdominal incision. If slight adhesions are attached to the appendages, they may easily be broken down with the fingers. When abundant or strong adhesions exist, there is danger of tearing some structure to which they are attached—*e.g.*, bowel, if the operator attempt to break them forcibly without first exposing the parts so that they are visible. In such a case the abdominal incision should be enlarged, and an assistant should carefully move the bowels aside from the region of the broad ligament, while the operator divides the adhesions with the fingers, with a knife-handle, with the end of closed forceps, or with scissors. If any bands are long enough to allow a catgut ligature to be applied, they should be ligatured and cut.

Sometimes it may be impossible to get at the parts without enlarging the abdominal incision and turning out the intestines. Great care should be taken in doing this. They should not be pinched nor pressed upon in any way. They should not be allowed to get cool or to dry. It is best to cover them carefully in towels wrung out of hot sterilised salt-solution. An assistant should attend to the renewal of

these as long as the intestines are outside the peritoneal cavity.

In this way access to the pelvis is easily obtained. If illumination be required, light from the window may be reflected into the abdomen by means of a mirror held by an assistant. Or an electric lamp may be employed. In the separation of adhesions care must be taken not to injure bladder, ureter, bowel, or any large vessel.

When the appendages on both sides require to be removed, and if bad adhesions exist bilaterally, it is best to break them down on both sides preliminary to removing the appendages. This is safer than to remove them on one side and then to break down the adhesions and remove the appendages on the other side, because when the latter method is adopted there is always danger of loosening the first applied ligature by the manipulations necessary to free the tube and ovary on the opposite side.

In some cases the adhesions may be so numerous and dense that it is impossible to free the appendages so as to remove them. In other cases, only partial separation can be carried out, so that removal of but part of the appendages can be effected.

When the tube and ovary can be made free from adhesions, they are raised towards the abdominal incision. The broad ligament is then pierced below the ovary with a pedicle-needle, carrying a silk or No. 4 catgut ligature, about 2 feet in length, the eye of the needle being placed at the middle of the ligature. In piercing the broad ligament, no vessel should be injured. The needle is then withdrawn. In the great majority of cases, the Staffordshire knot may be used to secure the pedicle (*vide* p. 135). If the pedicle

be thick or tense, interlacing sutures should be employed (*vide* p. 135). Before tightening the ligature, the tube should be well lifted up, in order that as much of it as possible may be embraced. After the knot is made, a pair of forceps is applied to each side of the pedicle, about three-eighths of an inch outside the ligature. An assistant then holds an absorbent pad under the forceps, and keeps the intestines and abdominal walls aside, while the operator cuts across the pedicle outside the attached forceps. The stump is carefully sponged. If there be no bleeding, the ends of the ligature are cut away, the forceps are removed, and the stump sinks into the pelvis.

If, after cutting through the pedicle, there be bleeding, or if the operator be in doubt as to the security of the ligature, two ends are again passed around the pedicle under the forceps and tied, before being cut short.

If the appendages on the opposite side are to be removed, they are treated in the same manner. If any bleeding has occurred from separation of adhesions, the pelvis is sponged carefully with hot pads. Sometimes irrigation with hot sterilised solution may be required. After-drainage may be necessary if there be continued oozing. The abdomen is closed as described on p. 156.

(*b*) *By anterior colpotomy.*—Recently this operation has been recommended in place of abdominal section. The operation is performed as described on p. 175. When the peritoneum is opened, the appendages are examined, freed from adhesions, and removed, the pedicle being ligatured exactly as when abdominal section is performed.

Cystic conditions of tube—*e.g.*, *hydro-*, *hæmato-*, *pyo-salpinx.*

(*a*) *By abdominal section.*—On opening the abdomen the state of both appendages is examined. If both are adherent, and if the adhesions can be broken down easily, this should be carried out before one tube is removed. The greatest care must be exercised in separating adhesions. For such cases, too small an abdominal incision should not be used. Plenty of room and free access are necessary. If, on examination, it is found that the adhesions cannot be broken without great danger of rupturing the cyst, the contents should be removed by means of an aspirator, care being taken that no drops of fluid escape into the peritoneal cavity. As soon as the aspirator is removed, the opening is closed with forceps, the tube drawn up into the abdominal opening, and adhesions separated.

Whether the tube be emptied or not before removal, the pedicle is secured just as it is when non-cystic diseased tubes are removed. After the sac is cut away, if the case be one of pyo-salpinx, it is important to cauterise the stump of the tube outside the pedicle. This may be done with a galvano-cautery, or with carbolic acid.

In cases where the cystic tube cannot be removed on account of adhesions, either of the following plans may be adopted:—

First, if the tube be fixed low down in the pelvis, behind the uterus, so that it may be opened through the vagina, the abdominal wound should be closed. After this is thoroughly healed, the cyst may be opened through the posterior fornix and drained. Vaginal antiseptic douches should be continued until the sac closes.

Second, if the tube be fixed high, so that the abdominal wall can be brought near it, the cyst should be aspirated,

then stitched to the peritoneal edges of part of the abdominal wound, a portion of the cyst wall being drawn into the wound if possible. The rest of the wound should be then closed. The opening into the cyst is enlarged, iodoform or naphthalene powder introduced, and drainage continued by means of iodoform gauze or a glass tube. The cyst cavity should be washed out each day with a solution of iodic hydrarg. (1 in 4000). The cavity gradually diminishes in size. A sinus may remain for a long time.

(*b*) *By anterior colpotomy.*—Cystic tubes may also be removed by this operation. If they are of small size, they may not require previous aspiration. If large, aspiration is necessary, adhesions being broken down in the ordinary manner. The pedicle is treated as in abdominal section. Large cystic tubes fixed behind the uterus by adhesions should not be treated by anterior colpotomy, but by abdominal section, or by an opening in the posterior fornix.

Solid tumours of the tube.—These are removed in the same manner as is an inflamed tube, by abdominal section or by anterior colpotomy.

Affections of the Ovary.

Prolapsus.—When removal of a prolapsed ovary is necessary, it may be carried out by abdominal or by vaginal section. The operation is carried out as in the case of a very small ovarian cyst. If the ovary be situated deeply in the pouch of Douglas, and vaginal section be undertaken, it is considered by some most convenient to make an opening through the posterior fornix.

Sänger recommends an operation for restoring the appendages to their normal level. After stitching the upper angles of the uterus to the anterior abdominal wall, he sutures the meso-salpinx to the side wall of the pelvis near the brim-level.

Hernia.—When one or both ovaries are displaced so as to lie in the inguinal canal, or in an abdominal hernia, causing much pain or discomfort, it may be necessary to cut down on the ovary, and remove it after having placed a ligature around its pedicle.

Inflammation.—The operative treatment of inflamed ovaries is of three varieties :—

1. Puncture and destruction of small cysts formed in certain cases.
2. Resection of a diseased part.
3. Complete removal.

Puncture.—Anterior colpotomy or abdominal section is performed, the ovary is freed from adhesions, and the small cysts which are present are punctured, and destroyed by means of a galvano-cautery.

Resection.—Anterior colpotomy or abdominal section is performed, and the diseased part of the ovary is cut out. The raw surfaces are then brought together by means of fine catgut sutures (No. 1).

Probably in all cases in which puncture or resection is to be carried out, the vaginal incision should be employed, unless the vagina be too small.

Removal.—When an inflamed ovary requires removal, the tube is taken away with it, since inflammation is so commonly present in it also. This operation is termed Salpingo-Oöphorectomy. I have already described it in connection

with salpingitis (p. 187). It is carried out either by means of abdominal or vaginal section.

Hydrops folliculorum.—If this condition require operative treatment, either puncture and destruction of the small distended follicles may be carried out, or removal of the whole ovary by means either of anterior colpotomy or abdominal section. The procedure is the same as in a salpingo-oöphorectomy.

Proliferating ovarian cyst.—The operation for the removal of an ovarian tumour has long been known by the name of Ovariotomy.

The nature of the procedure and the difficulty of manipulation vary according to the size and condition of the tumour, adhesions, condition of the patient's health, &c. For many years an abdominal incision has been employed for all varieties of cyst. Recently, Martin and others have advocated the advantage of anterior colpotomy for certain cases.

Small cysts not larger than two fists.—These may be removed by abdominal section, or by anterior colpotomy. If there are many adhesions which can be diagnosed, the former of these methods should be employed.

When the incision is made into the peritoneal cavity, the cyst, if very small, is removed along with the corresponding tube, just as in the case of a salpingo-oöphorectomy, preliminary evacuation of the cyst not being necessary.

Where the cyst is too large to remove in this way it is aspirated before the pedicle is secured.

Large ovarian cysts.—These should only be removed by abdominal section. The abdomen is opened as already described. The incision, to begin with, should be long enough to admit the hand.

In most cases the whitish surface of the cyst is seen next the abdominal wall. Its relation to the breathing should be watched for a moment. If it moves freely with respiration, no extensive adhesions to the parietes are present. The fingers of one hand are now introduced and carried all over the tumour to make out its relations and the presence of adhesions.

If only a few parietal adhesions exist they are broken with the fingers. If extensive, they are attended to after evacuation of the sac. Omental and intestinal adhesions are also left until after this is carried out.

Evacuation of cyst.—In order to reduce the size of the tumour, the cystic contents must be removed (save when

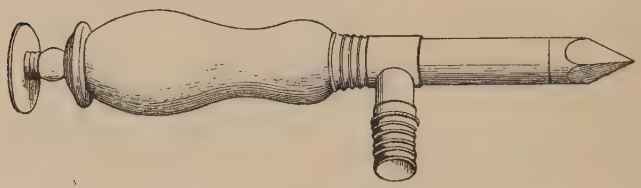


FIG. 25.—Trocar.

they are purulent or gangrenous; in such cases the tumour should be removed *en masse*).

Before puncture an assistant should steadily compress the patient's flanks with the palms of his hands, and should continue in this position as long as fluid flows from the tumour.

The largest cyst near the abdominal incision is chosen for puncture. Various trocars are used. The simplest mehtod is to pierce the cyst wall with a bistoury. As the assistant presses in the flanks, a thin stream of fluid (except

when it is thick), flows steadily out as a jet, and is caught in sterilised basins.

If the bistoury be not used, puncture may be made with simple trocar and cannula attached to a rubber tube. The latter hangs over the edge of the table and drains the cyst by syphon action. Large complicated trocars are not necessary; they are difficult to keep clean.

If the puncture of one cyst is not sufficient to reduce the size of the tumour so that it can be removed, other cysts should be opened from the interior of the one already punctured. This may be done with a finger, knife, scissors, or trocar.

In some cases on account of the colloid nature of the fluid or the presence of fibrinous clots, nothing escapes in the tube. This happens also when the tumour walls rupture owing to their brittleness, or because the cyst is so numerously subdivided. In these conditions either the cyst should be removed *en bloc* through a large abdominal incision or, if too large for this, it should be opened so that the hand can be introduced to remove the contents and to break down the septa.

If the cyst-contents are gangrenous or purulent, the tumour should be removed *en masse*. If, only after an opening has been made, the dangerous character of the contents has been found out, the opening should be closed with forceps and the tumour removed from the abdomen through an enlarged incision.

Usually only slight hæmorrhage results from the breaking-down of the cyst interior. Sometimes, however, marked bleeding occurs. When this happens the pedicle should be temporarily constricted with forceps until the cyst is

removed from the cavity, and the ligatures are ready to be applied.

Treatment of adhesions.—After the evacuation of the cyst-contents, the edges of the opening are grasped in strong forceps and the tumour is drawn outwards in order that adhesions may be severed. Parietal adhesions may be broken through with the finger tips; when they are very tough and tendinous, they may require to be cut through.

When there is a circumscribed patch of dense adhesion, the corresponding part of the cyst wall may require to be cut from the rest of the sac; in such a case, the lining secreting portion should be entirely dissected off.

Oozing takes place from torn adhesions. It may be checked by pressure of a hot sponge. Any points that bleed particularly freely may be tied or burned with a cautery. It may be necessary to pass the catgut through the tissue by means of a needle.

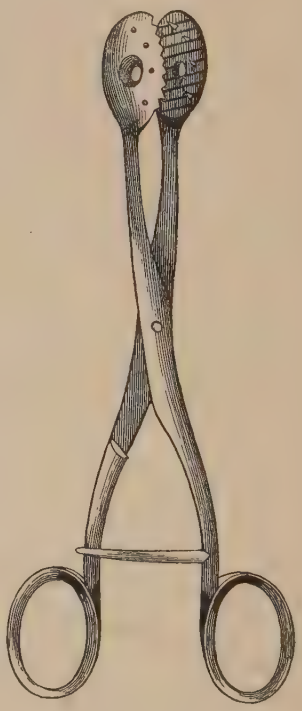


FIG. 26.—Nelaton's forceps, used in drawing out the cyst.

Parietal adhesions over the front of the tumour may make it difficult to know where the peritoneum is, during the

opening of the abdomen. In attempting to strip off adhesions one may at the same time remove the parietal peritoneum. After evacuating the cyst the distinction can usually be made and proper separation of the adhesions carried out.

Omental adhesions are next in frequency after parietal adhesions. Usually the omentum lies above the umbilicus. If it should lie in front of the tumour below the umbilicus, so as to interfere with the opening into the cyst, the incision should be prolonged downwards in order that the omentum may not be wounded. Sometimes, however, it reaches to the symphysis.

It should be separated from the parietes and an endeavour should be made to get to one side of it in order to puncture the cyst. If a piece of the omentum which is in the way can be conveniently ligatured and divided, this may be done. If there is no other method, it may be necessary to puncture the omentum in order to enter the cyst.

In drawing out the tumour the omental adhesions are gradually torn through. This is best brought about by rubbing them off with a dry sponge or gauze pad. Firm bands may require to be torn through with a pair of forceps or with the fingers. Bleeding vessels in the omentum may be ligatured with catgut. But if, when the omentum is freed, any extensive oozing surface should remain, strong catgut (No. 3) ligatures should be tied around it and the oozing part cut away.

Adhesions to mesentery and intestine are not very common. They are usually found on the back and sides of the cyst. If the adhesions are short, they should be torn through by being rubbed off the cyst with a sponge or

cut with a knife. If they are long, the bands may be ligatured and cut. If the adhesions are very firm and short it may be necessary to dissect a portion of the outer wall of the cyst to which they are attached, leaving it in continuity with the bowel or mesentery, care being taken that no part of the inner secreting surface is left.

When intestine is adherent to the pedicle it may not be easily recognised. Or when the pedicle is very broad and there are no adhesions, the operator may think that the bowel is adherent. When any extent of peritoneum has been torn from the bowel, the rawed surface should be covered with neighbouring peritoneum by means of fine catgut (No. o) and small needles.

Mesenteric adhesions should be separated and then ligatured or *vice versa*.

If the vermiform appendix be adherent, the adhesions should be torn through. If this be very difficult it may be necessary to remove it.

Splenic and hepatic adhesions must be divided with the greatest care.

Uterine adhesions are mostly found in cysts which lie in the pouch of Douglas and are adherent to it.

Bladder adhesions must be carefully dealt with. Sometimes the attached bladder may be mistaken for part of the cyst, and there is danger of cutting into it or removing it. This mistake is most apt to occur when the bladder is markedly displaced upwards. When the adhesions are divided, bleeding points should be ligatured.

Adhesions to the pelvic floor may be difficult to separate. Sometimes it is quite impossible. There is danger of tearing into a large vessel, the ureter, the bowel, or the vagina.

Bleeding points on the tumour may be held with forceps or with ligatures, until the pedicle is tied.

Treatment of the pedicle.—The pedicle consists of the tube, broad, ovarian, and infundibulo-pelvic ligaments. It varies greatly in length and width in different cases.

In cases of torsion it may be very brittle, the vessels being closed by thrombi. Sometimes the pedicle is double as a result of atrophy of a mesial portion.

Sometimes the appendages of the opposite side may be adherent to the cyst, thus making it difficult at first to say to which side the tumour belongs.

Intestines may become adherent to the pedicle, and should be separated.

Sometimes no pedicle is found in cases where torsion has occurred, the original pedicle having been thereby divided. The tumour thereafter thrives by means of the adhesions which have formed. If the tumour has developed between the layers of the broad ligament, or if it has grown behind the ligament and become attached to it, no pedicle exists. The treatment of these conditions will be considered later, p. 200.

The pedicle is secured by means of ligatures. To pass them the cyst should be drawn outside the abdominal incision and held by an assistant.

If very large, the mass of it may be cut away, large forceps securing the basal portion. This facilitates the application of the ligatures.

Strong chromic or juniper catgut (No. 4) or twisted silk ligatures may be used. They are passed with the special pedicle needle, care being taken not to pierce a vessel. If the pedicle be small, the Staffordshire knot may be used.

If it be large, or if it be short, two interlacing ligatures may be used.

If it be very broad three or more interlacing ligatures may be necessary. These have been described on p. 135. The pedicle is next grasped on each side with forceps, and the tumour cut away outside them. The stump is then carefully sponged. If there be any bleeding from it, the ends of a ligature are passed around the pedicle and tied firmly.

The ligature ends are next cut short and the forceps are removed.

Ovarian cysts which have developed within the broad ligament.—These are mainly papillomatous. Sometimes this extra-peritoneal development may be slight. In such a case, after the evacuation of the contents of the cyst, the pedicle may be secured by a series of interlacing ligatures passed under the cyst from the uterus to the infundibulo-pelvic ligament. In a more marked case, after evacuation of the intra-peritoneal portion of the cyst, the peritoneum covering the extra-peritoneal part is divided around its attachment, and the tumour is enucleated.

In the most marked cases, the whole tumour lies under the peritoneum. As it grows it may come into relation with various structures of the pelvis—*e.g.*, rectum, bladder, uterus, &c., and marked displacement of these may occur as well as firm adhesion to them.

In these cases before enucleation is attempted, the ovarian vessels should be controlled in the infundibulo-pelvic ligament by means of a strong catgut suture passed with a needle. After evacuation of the cyst contents, its walls are pulled outwards by means of forceps, and its

peritoneal covering is incised on the upper surface if the tumour be a pelvic one. If the cyst extend above the pelvis the peritoneum is cut around the swelling near its base. The tumour is then rapidly enucleated by means of the fingers; in some cases, by knife or scissors. Where there is firm attachment to a delicate structure—*e.g.*, bowel—it may be necessary to leave behind a bit of the outer portion of the cyst wall. None of the lining membrane should be left. It should be pulled or scraped away. Care must be taken not to injure the ureter or any large vessel. The ureter is white in colour; it may be distended somewhat in these cases.

There may be a good deal of bleeding as enucleation proceeds, but the preliminary ligature of the ovarian vessels tends to diminish this. The inner part of the tube and broad ligament may be ligatured close to the uterus at an early stage with advantage. The ureters must not be caught.

As vessels are torn through they must be caught with forceps and tied. Sometimes ligatures cannot be passed. The galvano-cautery may be used, or the pressure of a hot swab.

When the tumour is entirely removed, the peritoneal sac should be closed by continuous catgut suture. It then lies in a crumpled mass at the side of the uterus.

Sometimes when the uterus is too firmly attached to the tumour, its removal may be necessary.

When the cyst develops in the folds of the mesentery, its separation may be accompanied with much bleeding. Ligatures must be carefully used, because too wide portions must not be constricted lest the nutrition of the gut should be interfered with.

When the cyst grows up behind the peritoneum in the front of the pelvis and abdomen, the abdominal incision may not enter the peritoneal cavity at all. Usually, however, in such a case, it is opened into before the cyst can be entirely enucleated. If the cyst can be removed, the remaining cavity should be stuffed with gauze and allowed to close gradually, being shut off from the peritoneal cavity.

Double extra-peritoneal cysts.—These may be treated by a double procedure similar to that just described. Sometimes it is impossible to separate the uterus from the cysts, and its removal, along with that of the tumours, is necessary.

Incomplete operations.—Both in the case of extra-peritoneal and of intra-peritoneal cysts, which become very adherent to the pouch of Douglas, it may be impossible to remove the entire tumour.

In such cases, the inner lining—the secreting surface—should be torn or scraped off, oozing of blood from the rest of the wall being checked as much as possible.

If the remnant be a small one, it may be left *in situ*. If it be large, its edges should be stitched to the edge of the lower part of the abdominal incision, the cavity being drained with iodoform gauze, and allowed to close gradually.

In the case of the extra-peritoneal cyst, an opening may be made into the vagina, drainage being carried out by means of a T-shaped rubber tube and by iodoform gauze. In such a case, the first incision into the sac is carefully closed before the abdominal wound is stitched.

Dermoid cysts of the ovary.—These should be removed *en masse*. Evacuation should not be attempted because of the risk of escape of its contents into the peritoneal cavity.

The pedicle is secured just as in the case of simple cysts.

Solid ovarian tumours.—When these can be removed, whether simple or malignant, the procedure is the same as in the case of an ovarian cyst, save as regards the reduction of the size of the tumour.

Removal of a malignant growth need not be attempted when the diseased ovary is adherent to surrounding parts, and infiltrating them, or when growths exist elsewhere.

Ovarian cyst complicating pregnancy.—In such a case the cyst should be removed by abdominal section save when it is very small. The procedure is the same as in the non-pregnant state. Care should be taken to disturb the uterus as little as possible, not to puncture it, and not to mistake it for a cyst.

After the operation, the patient must be kept under the influence of morphine.

Adhesive plaster should be worn over the wound throughout pregnancy, as well as a carefully adjusted belt.

Parovarian and other circumscribed broad ligament tumours.—These are removed by abdominal section in the manner in which extra-peritoneal ovarian tumours are taken away.

Affections of the Uterus.

Stenosis of cervical canal.—The narrowing may exist at the os externum, the os internum, at both of these or in the whole canal.

The following operative procedures may be recommended to bring about dilatation :—

Instrumental Dilatation.—The patient is prepared for operation as described on p. 117. She is placed in the

lithotomy position and anæsthetised. The cervix is pulled down by means of a volsella. The size of the canal is estimated by the sound, and a series of Hegar's dilators are passed into the cervical canal until the stenosed portion is well stretched. Along with these a metal dilator—*e.g.*, Sims'—may be used.

Incision.—It is generally best to divide the stenosed portion as well as to dilate it. In the case of small external os, this may be carried out with a pair of scissors or an ordinary bistoury, the cervix being pulled down with a volsella.

The posterior lip may be divided in the middle line, or the cervix may be divided on each side. The depth of the incision is about three-eighths of an inch.

In the case of stenosis of the whole canal or of the internal os, after dilatation, a narrow, sharp-pointed bistoury is passed up the canal, and the wall at the internal os incised first on one side and then on the other. If the whole cervical canal is narrowed, each of these incisions can be extended down through the whole length of the cervix. The incision extends through the whole thickness of the mucosa and into the muscle.

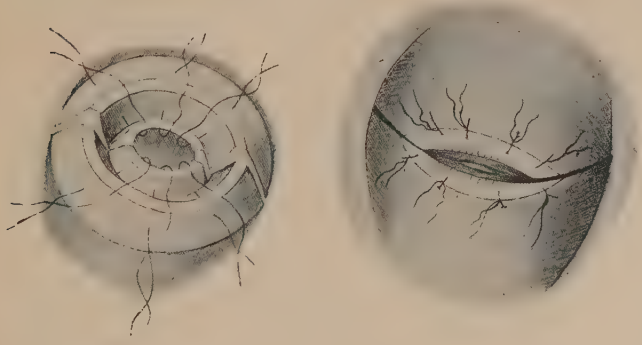
The after-treatment in these cases is important. The rawed surfaces should be swabbed with iodised phenol or Liquor Ferri perchlor. fort., and they should be kept apart by a small glass tube, or by a plug of iodoform gauze. These should be changed every two days for eight days. Afterwards, for ten days, the os should be kept open by means of Hegar's dilators or the finger.

Excision.—In cases of stenosis of the external os, this operation is preferred by some.

The cervix is pulled down with a volsella, and is split on

each side for half-an-inch. Out of each of these portions a wedge-shaped piece is cut with a sharp bistoury. The raw surfaces in each lip are then closed by catgut sutures, the edge of the cervical mucosa being joined to that of the vaginal portion. The lateral incisions are then closed. At the end of the operation, instead of the small os externum, there is left a large gaping one.

Traumatic atresia of the cervix.—The opening is made by means of a sharp bistoury, the cervix being steadied by means



1. 2.

FIG. 27.—Operation for enlarging the os externum by the removal of a wedge-shaped mass from the cervix. (MARTIN.)

1. Application of sutures after removal of tissue.
2. Appearance of cervix after sutures are tied.

of a volsella. A small circular portion may be cut out, and the raw surfaces swabbed with perchloride of iron. The after-treatment is important. A glass tube should be worn for a few weeks in order to prevent the part from closing.

Hypertrophic elongation of the cervix.—Amputation of part of the cervix is performed. Either of two methods may be employed.

1. *Flap amputation*, by removal of wedge-shaped portions from anterior and posterior lips.

The patient is placed in the lithotomy position. A short, wide, spatular speculum is placed posteriorly in the vagina. The cervix is pulled down with a volsella. The length of the uterine cavity is measured, so that the amount of tissue to be removed may be estimated. The cervix is then divided on each side as high as is desired—it may be three-quarters of an inch or more. In this way the anterior and posterior lips are separated.

The posterior lip is then held in the middle line at its lowest point by a volsella, the anterior lip being held out of the way by an assistant. With a bistoury a transverse cut is made across the posterior lip some distance below the upper limit of the lateral incisions. The edge of the bistoury cuts inwards and upwards. A second transverse incision, beginning on the lower part of the lip outside the os externum, extends upwards to meet the first transverse cut. In this way a wedge-shaped piece of tissue is removed.

The raw surfaces in the lip are then brought together, the mucosa of the cervical canal being approximated to that of the vaginal portion of the cervix. For this a series of interrupted catgut sutures are used, or a continuous suture may suffice.

A corresponding wedge-shaped portion is then removed from the anterior lip, and the raw surface closed. The anterior and posterior lips are then brought together by

means of a catgut suture passed on each side. The sutures are then cut short.

During the operation bleeding is checked by means of the hot douche which is used to irrigate the parts. Any marked vessel may be twisted or secured with catgut.

A vaginal plug of iodoform gauze is placed in the vagina, and the patient is put to bed. After twenty-four hours the plug is removed, and an antiseptic warm douche is given. This is repeated daily. By the tenth day the patient may sit up.

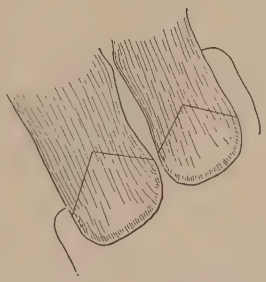


FIG. 28.—Flap amputation of cervix. (MARTIN.)

2. *Circular amputation.* — The cervix is pulled down with a volsella attached close to the os externum. With a bistoury a circular incision is made through the mucous membrane, covering the vaginal portion of the cervix just where the outer surface turns inwards towards the os externum. The mucous membrane is stripped upward above this incision by means of the thumb-nail and knife, leaving bare the musculature of the uterus. The upper limit is decided by the amount to be amputated. The cervix is then divided into an anterior and a posterior part as high as the line of amputation. The posterior lip is then cut across

FIG. 29.—Appearance of cervix immediately after flap amputation.

somewhat obliquely, so as to leave a thin flap next the cavity. The stripped-up mucosa is then turned over the stump, and its edge stitched to the thin flap next the cervical canal. Separate catgut sutures are used.

The anterior lip is treated in the same way. On each side of the canal the gaping redundant portions of the stripped-up mucosa should be closed by catgut sutures. Finally the cervical canal should be examined to see that it has not been closed by sutures nor made too small.

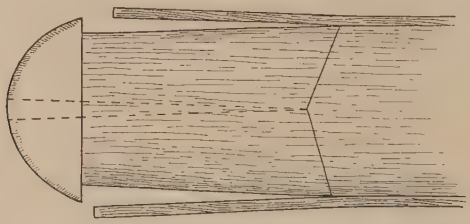


FIG. 30.—Diagram to show the method of amputating the cervix by the circular method.

The after-treatment is the same as described for the last operation.

Laceration of the Cervix of Old Standing.—(*a*) *Where the tear does not extend into the fornix.*—A spatular speculum is introduced into the vagina for the purpose of pulling back the posterior wall. If there be endometritis, the uterus should be curetted and iodised phenol should be applied to the endometrium. The cervix is then pulled down, the edges of the tear are pared, care being taken to raw the apex well. A bistoury or pair of scissors is used. The rawed surfaces are then brought together by a series of catgut sutures. The cervical canal should not be made too small.

An iodoform gauze plug is placed in the vagina for twenty-four hours. The after-treatment is the same as described for the last operation.

(*b*) *When the tear extends into the fornix, displacement of the uterus having resulted from the cicatrisation.*—A broad spatular speculum is placed against the posterior wall. The uterus is curetted if there be endometritis. The cervix is pulled with a volsella towards the sound side. A curved incision is made in the affected fornix close to the cervix, and following its curve, some of the cicatricial bands being cut through. As the cervix is pulled, the incision gapes, and its walls are brought together by sutures passed from before backwards, so that the resulting line of incision remains transverse.

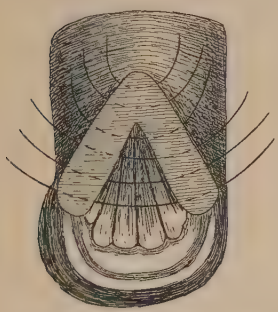


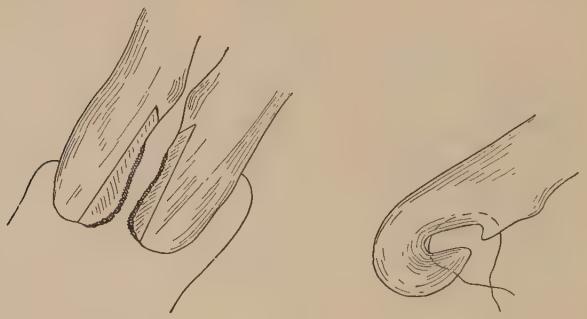
FIG. 31.—Emmet's operation for repair of laceration of the cervix. The diagram shows the rawing of the edges of the tear, and the method of passing the sutures.

(*c*) *When hypertrophy of the cervix, or of the whole uterus, or marked endocervicitis exists.*—In these cases it is best to split the cervix on the opposite side, after previously curetting the uterus, and to amputate the cervix by the flap method.

Chronic endocervicitis.—In slight cases the catarrhal patch may be thoroughly scraped with a curette, the Nabothian follicles emptied, and iodised phenol applied. Each day afterwards the vagina should be douched with an astringent antiseptic lotion (corrosive sublimate, 1 in 4000).

In bad cases removal of the inflamed surface is neces-

sary. As there is generally inflammation in the whole endometrium, it is well to curette the uterus first. The cervix is then drawn downwards, and is divided on each side as high as the fornix. A transverse incision is then made across the posterior lip, dividing the cervical mucosa. Another incision is then carried upwards from the extremity of the lip to meet the first one. In this way the diseased mucosa is entirely removed. The lower flap is then turned



1. 2.

FIG. 32.—Operation for removal of diseased mucosa in endocervicitis. (SCHRÖDER.)

1. The lines of incision are shown. 2. Passage of sutures.

upwards, and is stitched to the flap of the cervical mucosa by several catgut sutures. The anterior lip is treated in the same way. At the end, one or two stitches are placed on each side. The after-treatment is the same as in the case of a curetting.

It will be noticed that the only difference between this operation and the operation described on p. 206 is in the amount of tissue removed. In this one, only the mucosa

need be removed; in the other, some of the muscular part of the wall is removed.

Chronic endometritis.—In bad cases the best treatment is to remove the diseased endometrium by curetting. This operation has been fully described on p. 63.

After the operation an iodoform gauze plug is placed in the vagina for twenty-four hours. It is removed on the second day, and a daily antiseptic douche given, the patient lying in bed for eight days. At the following menstrual period there is apt to be an excessive discharge of blood, and it is advisable for the patient to rest a good deal during the period, and to take ergot inwardly.

Metritis.—In cases where the uterus is only moderately affected, in addition to the ordinary general and local treatment curetting may be performed.

In very bad cases curetting and amputation of one or both lips of the cervix is the most efficacious method of stimulating involution in the uterus.

Displacements of the Uterus.—I have already considered the treatment of displacements by means of pessaries (*vide* p. 87).

Anteflexion.—When this condition is associated with stenosis of the cervix, dilatation by one of the methods described may be beneficial.

Anteversion.—As this condition is practically only an accompaniment of metritis, its treatment is that of the latter condition.

Retroversion and retroflexion.—Various operative procedures have been tried in these conditions, but it is impossible yet to decide as to their relative merits. It must be clearly understood that no operation is to be undertaken

until every other good method of treatment has been used to benefit the patient. Most particularly must the inflammatory accompaniments of the displacement be attended to.

If the woman has no symptoms, no operative procedure should be undertaken. Radical treatment is, indeed, very seldom necessary.

The following methods may be mentioned:—

Shortening the Round Ligaments.—The patient is prepared as for an abdominal section. The mons veneris is carefully shaved, and the usual antiseptic measures are taken.

An incision two and a-half inches in length is made through the skin, extending from the pubic spine upward and outward parallel with the inguinal canal. The external abdominal ring is thus exposed. Oblique fibres run across it. The tissues bulging out of the ring are lifted up on an aneurism needle, the round ligament being pulled out as far as possible, as it runs towards the pubic spine. The ligament thus drawn out is stitched to the edges of the external abdominal ring by means of catgut, and the part outside the sutures may be cut away. The skin wound is then closed by means of silkworm gut.

This procedure is repeated on the other side.

After-treatment.—The wound is dressed in the ordinary manner. The silkworm stitches are removed about the seventh day. The patient may rise about the sixteenth day. She should wear a Hodge or Albert Smith pessary for a few weeks after rising.

Ventral Fixation (*Gastro-hysteropexia*).—The patient is prepared as for an abdominal section.

The abdominal wall is opened by the mesial incision

above the symphysis. The uterus is freed from adhesions, and the fundus is held forwards by means of a volsella.

With a full-curved needle three silk or silkworm gut sutures are passed through the abdominal walls a little more than half an inch from the line of incision and are carried into the substance of the anterior uterine wall, extending through a considerable part of its width.

The upper anterior surface of the uterus is then scraped slightly in order that the resulting adhesion may be strong.

Other sutures are passed through the edges of the remaining portion of the wound at a distance of less than half an inch from the line of incision.

The wound is then closed by an assistant, and the sutures are tied in the ordinary fashion. The ends are cut short, those which pass through the uterus being tied together.

After-treatment.—Every six hours for three days, the urine should be drawn off with a catheter. Thereafter the patient should pass water at regular intervals. On the ninth day, the stitches which do not pass through the uterus should be removed. Three or four days afterwards the remaining ones should be withdrawn.

In every other respect the case is treated as an abdominal section. By the end of the third week the patient can begin to walk, but before she rises, a Hodge or Albert Smith pessary should be introduced, and it should be worn for a month.

After-consequences.—These have not yet been clearly established. Interference with pregnancy may be caused, though cases have been reported where full time has been reached. The patient may be troubled with frequency of

micturition. There is a risk of incarceration of bowel in the utero-vesical pouch.

Vesico-fixation and Ventro-vesico-fixation.—Werth recommends these instead of simple ventro-fixation, because, after the latter operation, a space is left between uterus and bladder in which bowel may be incarcerated. Such a risk does not exist if the anterior surface of the uterus be stitched to the bladder, or if this, as well as ventro-fixation, be performed.

Vaginal Fixation.—Instead of the peritoneal cavity being opened, the anterior vaginal wall is divided in its upper three-fourths. The base of the bladder is separated from it and from the cervix. The peritoneal reflection from bladder to uterus is stripped upwards as high as possible, the cervix being pulled downwards with a volsella. The cervix is then pushed well back and catgut sutures (No. 3), passed through the edges of the vaginal incision, the cellular tissue between cervix and bladder, and the surface of the uterus below the peritoneum.

The remaining united edges of the vaginal wound are then closed with continuous catgut.

Note.—These operative measures for fixing the uterus are only on their trial.

Inversion of the Uterus.—*Recent.*—If a case be seen soon after inversion has occurred, it may be possible to undo the inversion and to replace the uterus at once. The patient anæsthetised is put in the lithotomy position, the genital tract being carefully washed with antiseptic solution. The rectum and bladder should be emptied, and bi-manual reposition should be attempted. One hand is placed on the lower abdominal region while

the other grasps the mass of the uterus, pushing it up and undoing the inversion. Sometimes it is best to dimple inwards one part of the wall, making the rest follow. If there be a tumour attached to the wall which can be removed, its base should be ligatured and the mass cut away. It may be safest to do this when the uterus is replaced.

After replacement the uterus is douched with a hot antiseptic solution. The cavity is then packed with iodoform gauze, as well as the vagina, and the patient put to bed.

After-treatment.—In two days the plug is removed, a daily hot uterine douche is given, and ergot is adminstered by the mouth. The patient lies in bed according to the nature of the condition. If it is a puerperal case, for twelve or fourteen days; if not, about eight days. If a tumour has been removed, for two or three weeks.

Chronic.—Previous to the attempt to replace the uterus the patient should be kept at rest in bed for a few days, the bowels being moved regularly. If the inverted uterus does not extend outside the vulva, a Barnes' bag should be distended in the vagina each day. This may cause the uterus to be replaced. But if not, it causes the vagina to be stretched so that there is more room for the manipulations required. The night before the operation a dose of opening medicine should be administered, and the next morning an enema should be given, the rectum being afterwards washed out with boracic lotion. Morphine should be given. The patient is anæsthetised and placed in the lithotomy position. The vagina is well lubricated with antiseptic vaseline, and the bi-manual manipulations already described are attempted. Sometimes, by pressing a fore-

finger into the rectum, the uterus may be steadied and counter pressure may be made. Some, in addition, have passed the other forefinger into the bladder.

When the hand gets tired of pressing up the fundus, continuous pressure may be exerted on it by means of a cup and stem attached to a spiral, which is pressed against the operator's chest. It may be necessary to pull the cervix down with a volsella. Sometimes incisions into it are necessary.

If partial reposition can only be obtained at one sitting, the patient should be put to bed, a Barnes' bag being placed in the vagina. Opium should be given.

When manual manipulations fail to replace the uterus, continuous slight elastic pressure may be kept up by means of a cup and curved stem attached to elastic bands, which are fastened to an abdominal belt. A pad soaked in antiseptic vaseline is placed in the cup, which is made to press against the inverted fundus, in the line of the axis of the uterus. Counter pressure is kept up by means of a pad placed above the pubes, and held in position with an abdominal band.

If all methods fail to bring about replacement, the question of removal of the uterus must be considered. If malignant disease, bad ulceration, or gangrene exists in the wall, amputation or extirpation should be performed. In either case, the most thorough disinfection of the uterus and vagina should be made.

Amputation.—The patient is placed in the lithotomy position. The inverted fundus is steadied with a volsella. Carefully determine the natural neck of the inverted portion. Pierce the neck with a pedicle needle carrying a strong

double silk ligature. Withdraw the needle. Divide the ligature into two equal parts. Interlace them and embrace the neck, tying the ligatures on each side.

Then grasp the neck three-eighths of an inch below the ligatures with two pairs of forceps, and cut off the uterus below them. If there be any bleeding from the stump, tie the neck again with one of the ligatures already passed. Then cut short the ligatures, remove the forceps, and place an iodoform gauze plug in the vagina. This is removed in two days, and an antiseptic douche is given daily.

There is some risk that the stump may spring back into the pelvis and the wound burst open.

Extirpation.—This should undoubtedly be performed if sloughing, gangrene, or malignant disease exists in the uterus. For the method see below.

Carcinoma cervicis uteri.—When this disease has not spread beyond the cervix, two operations are employed for the removal of the disease—viz., high amputation of the cervix above the limit of the cancer, and total vaginal extirpation of the uterus. Both of these methods have been followed with success, but the tendency at present is to limit the former of them to a very small number of cases—*e.g.*, those in which it is definitely certain that the disease is very early, strictly limited, and capable of being removed by a high amputation. In all other conditions, and especially in cases of doubt as to the extent of the disease, extirpation of the uterus should be performed.

High amputation.—The circular method is employed, the operation being carried out as described on p. 207.

Vaginal extirpation.—This can only be carried out when the vagina is not too small. If more room be desired in

any case, the vagina should be distended with Barnes' bags two or three days previous to operation. Sometimes during the operation it is well to divide the perineum on each side of the middle line in order to obtain more room. These wounds can be closed at the end of the operation.

The patient is prepared for the operation as described on p. 116. Great care must be taken to destroy all sources of septic infection by antiseptic douchings and packing with gauze.

The patient is placed in the lithotomy position, the bladder and rectum being empty. The vagina is stretched by means of short anterior and posterior spatular specula, and lateral retractors. The cervix is drawn downwards and forwards, and held with a volsella by an assistant.

The surface of the diseased portion should be carefully cleansed of all discharge, and should be thoroughly swabbed with turpentine, and then with a solution of zinc chloride. Any portion which is breaking down or is apt to be broken down during the operation, should be removed with a curette, the raw surface being burned with a galvano-cautery or touched with a strong solution of perchloride of iron.

The pouch of Douglas is then opened by a transverse incision through the junction of the posterior vaginal wall and cervix. Bleeding points on the uterus are tied. It is checked on the vaginal flap by means of a continuous suture, which brings together the edges of the peritoneum and vaginal mucosa.

The pouch of Retzius (utero-vesical) is then opened, the cervix being pulled downwards and towards the back. A transverse incision is made through the junction of the

anterior wall and cervix as deep as the uterine musculature. The bladder is then stripped upwards from the cervix, and the utero-vesical layer of peritoneum is cut across transversely. Then the cut edge is united to the edge of the anterior vaginal wall by catgut suture, thus covering the back of the bladder. The broad ligaments now remain to

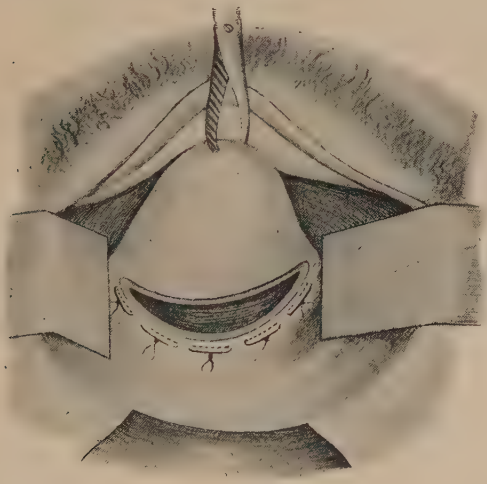


FIG. 33.—First stage in the operation of vaginal extirpation of the uterus. Opening into the pouch of Douglas. (A. MARTIN.)

be secured and divided. At this stage the pelvis should be explored with a finger, and uterine adhesions broken down. To secure the ligaments the ligature method or the clamp method may be used.

(*a*) *Ligature Method.*—Strong silk ligatures are passed by means of a curved pedicle needle through the broad

ligament on each side, a short distance out from the uterus, the forefinger being passed into the peritoneal cavity to guide the needle. The lowest ligature should secure the uterine artery, and should not embrace the ureter. The higher in the broad ligament, the farther out from the uterus the ligatures may be passed. As each one is tied, the ligament is divided internal to the knot by means of scissors.

If, during the operation, the intestines tend to prolapse and interfere with the manipulations, they may be kept up by an iodoform gauze pad placed in the pelvis.

If the tubes and ovaries come down easily they may also be removed, but it does not matter if they be partly left behind. When the uterus is removed the pelvic cavity may be washed out. Ligature ends are then brought down into the vagina, those of each side being tied in a bundle. Some operators use catgut ligatures (No. 4). In such a case the ends may be cut short. They should not reach so far as the vulva.

If a very wide opening remains in the vaginal roof, it can be made smaller by means of a catgut suture. But there is no necessity for closing it entirely. A plug of iodoform gauze should be carefully placed against the fornix. If there has been oozing in the pelvis, a portion of gauze should be passed through the opening to act as a pelvic drain.

After-treatment.—The patient lies in bed, and is treated generally as after an abdominal section. The urine is drawn off every six hours for five days, and thereafter the patient passes water at regular intervals. On the day following the operation the gauze plug should be removed from the vagina if there has been much oozing from the pelvis. If there has been only a little discharge, it should not be taken away

until the third day. Thereafter the vagina should be douched daily with a double catheter, a solution of iodic hydrarg. (1 in 6000) being used. After each douche an iodoform pessary should be passed into the vagina.

Between the second and third weeks the ligatures usually begin to drop off. Sometimes undue retention of a ligature is associated with rises in temperature.

If they are not all away by the eighteenth or twentieth day, the patient should be placed in the lithotomy position, and they should be carefully removed.

Catgut sutures, as a rule, give no trouble.

(*b*) *Clamp Method.*—The clamp used is a pair of long forceps, with a separable lock. At the handles there is a catch, with which they can be held together. When the anterior and posterior peritoneal pouches are opened, the forceps are placed on the broad ligaments, embracing their whole extent, and the uterus is cut away internal to them. When it is impossible to secure the ligament by one clamp on each side, the lower half of the ligament is clamped on each side, the corresponding part of the uterus being cut free. The uterus can then be pulled down, so as to allow of the application of forceps to the rest of the ligament. The whole uterus is then removed. The handles of the forceps are tied, to prevent them from opening. A plug of iodoform gauze is placed in the fornix. The handles of the forceps are kept from pressing unduly against the vaginal walls by gauze pads. The patient is then placed in bed.

After-treatment.—In general the same as that just described. The forceps are carefully removed from thirty to forty hours after the operation, and an iodoform gauze plug

is placed in the vagina. After three weeks the patient should rise.

The clamp operation is more quickly carried out than the ligature method. It is held to be more convenient when perimetritis or parametritis makes it difficult to draw the uterus down.

The dangers connected with vaginal extirpation are after-hæmorrhage, sepsis, injury to bladder, ureter, or intestine.

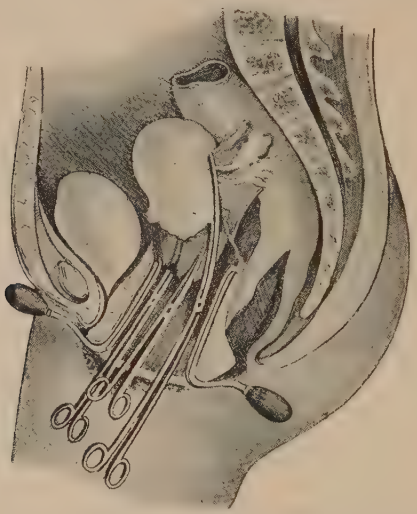


FIG. 34.—Vaginal extirpation of the uterus. Clamp method. Application of clamps to broad ligaments. (PEAN.)

Abdominal hysterectomy.—If, on account of the size of the vagina, the vaginal method be impossible, the abdominal method should be employed. It is very rarely required. The method is described in connection with myoma uteri.

Cancer of the cervix too advanced for complete removal.—In many cases, instead of allowing the disease to follow its own course, it is advisable to carry out certain measures of a palliative nature, in order to keep the patient in as comfortable a condition as possible.

For sharp hæmorrhage, plugging of the vagina for two or three days with iodoform gauze is the best remedy. To keep down the offensive discharge various douches may be used—*e.g.*, solution of potassium permanganate, corrosive sublimate, or iodic hydrarg., &c. After the douche a mixture of equal parts of glycerine and olive oil should be injected into the vagina, and the vulva lubricated with the same mixture.

To destroy the superficial portions of the growth the following means may be used:—

Curettage with application of the Cautery or Caustic.—The carcinomatous tissue is scraped out with a spoon-curette, care being taken not to perforate the uterine wall. Bleeding is checked by the application of an iodoform gauze plug to the scraped surface for a few minutes. When it is removed the ball-point of Paquelin's cautery is applied at a dull red heat.

An iodoform gauze plug is then placed in the cavity and in the vagina for two days. Afterwards a daily antiseptic douche is used.

Instead of the cautery, pledgets of wool soaked in a 50 per cent. solution of zinc chloride may be placed against the raw surface. These are covered with a dry piece of wool, and below, a plug of iodoform gauze soaked in a saturated solution of sodium bicarbonate, is placed.

After eight or nine days the plugs are removed and the

surface of the cancer comes away as a slough. Iodoform gauze is then packed in the cavity for a couple of days, and is followed afterwards by antiseptic douches.

Amputation of as much of the cervix as possible.—This may be carried out by the methods already described (p. 207).

The ecraseur or galvano-caustic wire may also be used for this purpose. The patient is placed in the lithotomy position, the vagina opened with specula, the cervix held with a volsella, and the chain or wire is then placed around it. The amputation should proceed very slowly. If there is bleeding afterwards the points should be touched with the Paquelin cautery, and an iodoform gauze plug placed in the vagina for five or six days.

Carcinoma corporis uteri.—If the disease be diagnosed early, before spread and fixation of the uterus to neighbouring structures have taken place, total extirpation of the uterus through the vagina should be undertaken. If the size of the vagina will not allow this to be carried out, abdominal hysterectomy should be performed. In either case the appendages should be removed, lest they be affected.

When the disease is too far advanced for extirpation, palliative measures only can be adopted. These are much the same as in the case of irremovable cancer of the cervix, —*e.g.*, antiseptic douches, packing of the vagina, curetting of the interior of the uterus, and application of styptics and antiseptics from time to time.

Sarcoma uteri.—Total extirpation of the uterus is the best means of radical cure.

If this be impossible, palliative measures similar to those employed in cancer of the uterus must be used.

Fibro-myoma of the Uterus.—SUB-PERITONEAL TUMOURS.—Sub-peritoneal pedunculated fibroids require treatment when they cause pressure symptoms or are apt to become incarcerated in the pelvis, or when they grow into the broad ligament. Sometimes, in the course of an operation for some other cause—*e.g.*, salpingo-ovaritis, they may be removed.

These tumours should be removed by abdominal section.

If the growth possess a small pedicle it is ligatured by the Staffordshire knot or by interlacing sutures, the tumour being cut away outside the ligature. If the pedicle be a thick one, three or more interlacing sutures should be employed. Before passing the needle through a thick pedicle it is best to place a temporary elastic ligature around the uterus as low as possible. This is taken off after the tumour is cut away. If there be any oozing through the stitches a few deep catgut sutures are passed and tied.

When the intestine is attached by adhesions to the tumour, they should be removed in the ordinary manner, if slight. If they are firm and extensive, the superficial layer of the fibroid should be dissected off and left on the bowel, the raw surface being closed by continuous catgut sutures.

INTERSTITIAL TUMOURS.—(*a*) *Single and of moderate size.*—Such growths may give rise to symptoms—*e.g.*, pain, for which operative treatment may be deemed necessary.

Sometimes symptoms may be checked by ligature of the uterine artery on each side. This is done with a full-curved needle and a Martin's needle-holder.

The cervix is pulled down and the needle passed through the lateral fornix and lower part of the broad ligament.

If the patient be not near the menopause the following operation is recommended by many authorities.

Enucleation by abdominal section.—Before the operation the vagina and uterine cavity should be made aseptic. After the abdomen is opened, the uterus is drawn up and surrounded with hot sponges. An elastic ligature is placed temporarily around the cervix and broad ligaments.

The capsule of the tumour is incised and the growth enucleated, care being taken not to open into the uterine cavity.

The cavity is then closed either by continuous catgut suture or by a series of interrupted sutures passing under the whole extent of the wound.

If the uterine cavity be opened into, the mucous membrane should be stitched together with catgut and the rest of the wound closed as described.

If a large opening be made, an iodoform gauze strip should be passed down through the cervix to act as a drain, while as much of the wound as possible should be closed.

Sometimes a very large opening may be made. If the closure of the wall be difficult, the question of extirpating or amputating the uterus may arise.

Removal of appendages.—If, however, the patient be near the menopause, the best operation to perform is salpingo-oöphorectomy or removal of the appendages. This is performed by abdominal section. Anterior colpotomy is recommended by some, for this purpose, when the tumour is of small size.

The method of removing the appendages is the same as in the case of their removal for inflammatory disease. Care must be taken to remove the whole tube and to secure as

much of the broad ligament in the pedicle as possible. If it is not possible to take in a large portion of the ligament, it is well to secure the ovarian artery by a special ligature around the infundibulo-pelvic ligament.

(*b*) *Single large, or multiple small fibroids.* — Various operations are performed when these conditions cause distressing symptoms :—

1. *Removal of the appendages.*—This method has just been described.

2. *Amputation of the uterus* or supra-vaginal hysterectomy.

FIG. 35.—Supra-vaginal hysterectomy. Method of ligaturing broad ligaments.

(*a*) *By the Intra-peritoneal method.* — Beforehand, the vagina and uterine cavity are made aseptic.

The abdomen is opened in the middle line. In cutting towards the symphysis care must be taken not to wound the bladder, which may be displaced upwards. If there are any cystic portions whose puncture will allow of a diminution in size of the tumour they should be emptied, if accessible.

The abdominal opening must be large enough to allow the tumour to be lifted out. If necessary, the opening may be enlarged by an incision at right angles to the first one. The relations of the bladder must now be studied, a male sound being passed into it. It is best in such cases that the patient should not empty the bladder before operation, in order that its position may be better defined on opening the abdomen.

If it is very high it may require to be separated somewhat from the tumour.

Adhesions to the tumour are separated.

The broad ligaments must now be ligatured, first on one side and then on the other, in order to secure the vessels.

If the tumour mass be not too great this may be accomplished while the parts are in the abdomen. If the mass be large it is best lifted out of the abdomen. The bowels should at this stage be prevented from being exposed to the air. If necessary, aseptic warm pads may be placed over them.

The ligatures are applied from above downwards, first on one side and then on the other. No. 4 catgut may be used or strong pedicle-silk. Each is passed double by means of a pedicle needle. The needle is first passed below the ovarian artery in the outer part of the broad ligament, care being taken not to penetrate a vein.

The needle is removed and the ligature is divided. The halves are then pulled apart for about half-an-inch or more, a transverse split being made in the ligament.

The outer ligature is next tied outside the ovary and tube, the inner one being tied internal to the ovary. The ligament is then divided between the ligatures almost as far down as the slit. The needle is again passed through the ligament at a lower level but closer to the uterus, in order to

avoid the ureter, and the same procedure carried out. The needle may be passed again if necessary. The ligament is thus divided as low down as the cervix.

An elastic ligature is then fastened around the cervix tightly, the ends being held in a piece of grooved vulcanite or a pair of strong forceps.

A circular incision is then made at least 3 cm. from the ligature through the peritoneum covering the uterus tumour mass.

It is stripped downwards for a little and then the rest

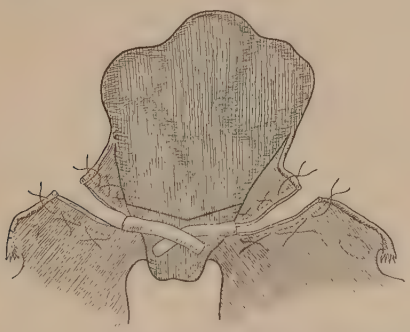


FIG. 36.—Supra-vaginal hysterectomy. Application of elastic ligature. Size of incision above ligature is shown.

of the mass is cut circularly, the knife blade being directed downwards somewhat. The tumour is then removed. The stump now remains to be secured, the raw surface being funnel-shaped. The cervical canal must be thoroughly cauterised with the Paquelin cautery or with strong carbolic acid.

A series of interrupted silk sutures are first passed through the whole thickness of the wound. Before they are tied the

raw surface of the stump is closed by means of a carefully applied continuous catgut suture passed in stages from the bottom to the top of the wound. The peritoneal edges should be carefully brought together. The silk stitches should then be tied somewhat obliquely to the vertical axis of the stump.

The wound should be closed from side to side—*i.e.*, the peritoneal edge should lie antero-posteriorly.

The elastic ligature is now removed. If there is any bleeding from the stump either of the following plans may be adopted. The uterine arteries may be secured on each

FIG. 37.—Supra-vaginal hysterectomy. The diagram shows the stump of uterus left at close of operation.

side by means of a needle and catgut ligature; the collateral circulation will be sufficient to supply the stump. Or the stump may be pierced and ligatured in two halves by interlacing sutures.

After careful cleansing of the peritoneum the abdomen is closed.

It is not necessary to drain the abdomen unless there be persistent oozing from the stump.

Note.—This operation may be a prolonged one, and there may be much shock. There is danger of after-hæmorrhage, sloughing of the stump, and sepsis.

(*b*) *By the extra-peritoneal method.*—The broad ligaments are secured and divided as already described. The elastic ligature is then passed twice around the uterus and secured. Forceps are attached to the stump outside the ligature, and the tumour mass is cut away about two finger breadths above the ligature. If any small fibroids are seen in the raw end of the stump they are removed. Any vessels noticed may be tied. The peritoneal cavity is now cleansed.

The elastic ligature should have been placed so as to act as the permanent ligature. If it has been placed too far down on the uterus another may be applied outside it, the first one being removed.

If there be no special catch for holding the ends of the elastic ligature, they may be secured with strong silk ligature.

Some operators tie the pedicle with silk outside the elastic band.

The peritoneum below the elastic ligature should next be carefully stitched to the peritoneal edges of the lower angle of the wound.

The remainder of the peritoneal edges of the wound should now be closed with continuous catgut suture. Then the muscular and fascial layers are brought together in the same way; not, however, within an inch of the stump. The skin edges are then brought together to within an inch from the stump.

The pedicle is next pierced by two strong pins, placed nearly at right angles; the sharp ends must be fitted with caps. Iodoform gauze is placed beneath them. In this way the pedicle is prevented from sinking into the pelvis. The stump is then neatly trimmed, the mucosal

and the raw surface being cauterised with a Paquelin cautery.

In the cavity surrounding the stump naphthalene powder or naphthalene mixed with salicylic acid powder or iodoform is sprinkled, and it is filled with iodoform gauze. The pedicle is covered with the same powder. The usual dressings are then placed on the abdomen and the patient is put to bed.

After-treatment.—In eight or nine days the dressing is

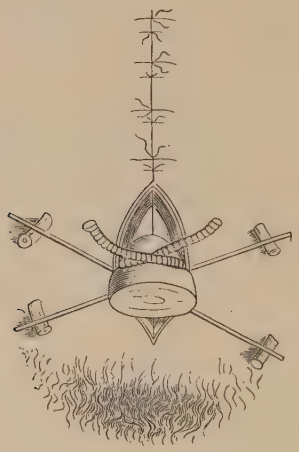


FIG. 38.—Fixation of the pedicle in the extra-peritoneal method. (POZZI.)

changed, though sometimes it is necessary to do so beforehand. It is best that the wound should be disturbed as little as possible. Between the second and third week the elastic ligature, the stump and the pins, usually drop off. The resulting cavity lined with granulation

tissue is dressed with iodoform gauze packing from day to day.

Otherwise, the after-treatment is the same as after an ovariotomy. The patient should not rise until the cavity has begun to fill up.

Note.—This method, it is evident, can only be adopted when a sufficiently long pedicle can be obtained. It is associated with risk of sepsis from sloughing of the stump. Sometimes the pedicle retracts and the peritoneum is opened. The resulting scar is a weak one. An abdomino-cervical fistula may remain.

If the appendages be left behind, hæmorrhage may occur at the wound at menstrual periods.

In favour of this operation is the rapidity with which it can be performed as compared with the intra-peritoneal method.

Wölfler modification.—This operation is carried out as in the case of an intra-peritoneal amputation. The stump is then brought to the lower part of the abdominal incision, to the edges of which it is stitched by means of sutures passed through the thickness of the abdominal walls. The abdominal wound is then closed, save immediately over the stump.

The opening left is packed with iodoform gauze.

Note.—This operation possesses the advantage of the other extra-peritoneal method, without the risks attendant upon the separation of the pedicle. Adhesion soon takes place between the stump and the abdominal wall, the opening above the stump gradually closing by granulation tissue.

(*c*) *Pan-hysterectomy.*—It is believed by many that complete removal of the uterus, along with the tumour, is a less dangerous operation than amputation. As yet it is impossible to decide regarding this point. It has been very successfully employed by some operators, and will undoubtedly occupy an important place in the future treatment of fibroids.

The patient is prepared as has already been described. After the incision is made in the abdomen, and the tumour lifted out, the broad ligaments are secured and divided as low as the cervix in the manner described on p. 228. The reflection of the peritoneum to the cervix is then divided transversely, and the bladder separated as far as the vaginal wall.

An assistant then passes a sound up the vagina and presses in the anterior fornix in order to furnish a guide to the operator, who cuts upon it, and then divides the whole anterior fornix transversely.

The lowermost portion of the broad ligament is then

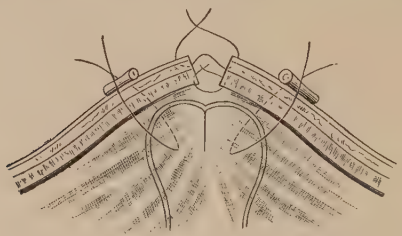


FIG. 39.—Fixation of the pedicle by Wölfler's method. (POZZI.)

ligatured, the needle being passed just above the vaginal surface. Care must be taken not to embrace the ureter. It may sometimes be recognised by its white colour. The broad ligaments are then cut through, and the posterior fornix is divided close to the uterus.

The tumour mass is then removed. The peritoneum and vaginal mucosa should next be approximated all round the opening in the vagina, by means of continuous catgut suture. The pelvis is then cleaned and the ends of the

lower ligatures, if of silk, brought into the vagina. When catgut is used the ends are cut short. A round mass of iodoform gauze is fitted into the opening, its ends passing into the vagina to act as a drain. The abdomen is then closed and the patient placed in bed.

After-treatment.—This is much the same as after intra-peritoneal amputation. The urine should be drawn off every six hours for five days. The iodoform gauze should be removed on the second or third day, and a fresh vaginal plug introduced. After ten or twelve days vaginal antiseptic douches may be carefully given with a large double catheter.

Intra-ligamentous fibroids.—These are fibroids which generally grow from the cervix or lower part of the body of the uterus, and extend into the extra-peritoneal connective tissue. They may grow into the meso-rectum, or displace the bladder in some cases. Most extend laterally into the broad ligament. In these cases, removal is often very difficult owing to the immobility of the mass, the absence of a pedicle, and the relationship to viscera.

Small tumours may be removed easily. Large ones often cannot be removed. When removal is impossible, the appendages should be taken away, and the broad ligament on the side opposite the tumour should be ligatured and divided.

If extirpation of the mass be attempted, the ovarian artery in the outer part of the broad ligament should be ligatured. If possible, the uterine artery on the same side should be secured.

A long incision should be made through the ligamentous covering of the tumour, which should then be drawn upwards with a strong volsella, while with the fingers and

a spatula it should be shelled out. Bleeding vessels are caught with forceps. The ureter must be avoided.

If there is a small pedicle attached to the uterus it may be ligatured with interlacing silk sutures. If it be impossible to carry this out, the whole uterus should be extirpated. If, after the removal of the tumour, the arrest of bleeding is difficult, the operator should also proceed to the removal of the whole uterus.

After removal of the tumour, if extirpation of the uterus be not necessary, the next step is to treat the bed of the tumour. The raw surfaces should be brought together by continuous catgut suture.

The pelvis is then carefully sponged. If there be any oozing, drainage is carried out by means of a glass tube through the abdominal wound.

Another method is to make an opening from the cavity occupied by the tumour into the vagina, to place gauze in the sac, the ends being passed into the vagina. The incision that was made into the peritoneal covering of the tumour is then closed, and the abdominal wound stitched. The gauze is removed in a few days *per vaginam*, and daily antiseptic douches are given afterwards by means of a double catheter.

Sub-mucous Fibroids of the Body.—(*a*) *Pediculated.*—In the great majority of cases removal by way of the vagina is to be performed. The patient is placed in the lithotomy position. The genital tract is made aseptic. When the polypus does not project through the os externum, or only slightly through, dilatation of the cervical canal should be carried out in the first place. This may be done with a sponge-tent the night before the operation,

and with Hegar's dilators at the operation. When, in this manner, sufficient room cannot be obtained for the securing of the pedicle, the following procedure should be adopted:—The cervix should be steadied with a volsella, and the junction of the anterior vaginal wall and cervix divided transversely, the bladder being stripped upwards as far as the os internum. The anterior lip of the cervix is then divided in its whole length, bleeding points being held with forceps. In this way room is obtained.

Various methods of treating the pedicle are adopted. If small, the tumour may be held with forceps, and twisted off. Or, if large, twisting may be combined with snipping of the pedicle with scissors. The pedicle should not be divided close to the uterine wall.

Some operators prefer to transfix the pedicle and secure it by means of strong pedicle-silk, the tumour being cut away below it.

Others prefer to cut slowly through the pedicle with the serre-nœud or the ecraseur. Sometimes the nail-curette is of use.

When the tumour lies in the vaginal canal, the procedure varies in different cases. If the tumour be small, it may be pulled down easily along with the cervix, and the pedicle may be divided, as described above, inside the cervix. If the tumour be large, it is necessary to reduce it in size before the pedicle can be reached.

This is best done by cutting circularly through the capsule, shelling the tumour out as far up as possible, and then cutting away portion after portion of the tumour, bleeding being checked by means of forceps. When the pedicle is reached it may be ligatured, and divided with the ecraseur or

with scissors. To pull down the tumour large strong forceps are required.

Sometimes, to gain access to the vagina it may be necessary temporarily to divide the perineum on each side.

If the cervix should have been opened, its edges should be closed, and the incision into the anterior fornix stitched.

After the removal of every tumour, the uterine cavity should be thoroughly cleansed, and it should be packed with iodoform gauze, along with the vagina. This can be removed on the third day, and antiseptic douches given daily afterwards. After a week or ten days, it is well to curette the whole uterus, in order to remove the general mucosa, which is more or less diseased, in order to stimulate the uterus to involution.

(*b*) *Non-pediculated.*—When the fibroid is not pediculated its removal is much more difficult. If very large, the reatment should be abdominal removal of the appendages or pan-hysterectomy—*i.e.*, if the symptoms demand operative interference.

Ligature of the uterine arteries may alone be tried in some cases. Symptoms may be checked and the growth of the tumour retarded for a time.

FIG. 40.—A. R. Simpson's nail-curette.

Curetting may cause improvement in some hæmorrhagic cases.

Small tumours.—Where the tumour is small or of moderate size, its removal may be undertaken by way of the vagina.

The patient is placed in the lithotomy position, the genital tract being made aseptic.

The vagina should have been stretched for several days by means of packing.

The cervix should be dilated. In order to gain more room, it should be divided, as described on p. 237, and again closed when the operation is ended.

If bleeding be feared, the uterine arteries of both sides may be ligatured by means of a full-curved needle.

If the tumour be smaller than a closed fist, it may be enucleated *in toto*. The most prominent portion is held with a volsella. An incision as long as possible is made through the capsule along the line of junction of the prominent part of the tumour with the uterine wall.

The tumour is then shelled out of the capsule with the fingers and a spatula, the mass being gradually drawn out with forceps.

It may be necessary to cut some of the adhesions with scissors. The tumour may be gradually twisted as it is withdrawn. If it is rather large to pull down *en masse*, it may be divided.

The bed of the tumour has now to be attended to. All loose shreds of tissue are removed, a hot uterine douche is given, and the raw cavity plugged with iodoform gauze, which is prolonged into the vagina.

If the cervix has been divided, it is now closed, and the

patient put to bed. Ergot is administered daily. On the fourth day the plug is removed, and antiseptic douches are given daily. If there should be any fresh bleeding, plugging can again be carried out.

Note.—The dangers of this operation are perforation of the uterus, inversion of the uterus, hæmorrhage, incomplete removal of the tumour, septicæmia.

Large tumours.—Removal of the mass bit by bit (*morcellement*) is employed by some operators.

The patient is prepared as for the other operations.

The cervix is first dilated somewhat.

The junction of the vaginal mucosa to the cervix should be circularly incised, and carefully stripped up as far as possible. The cervix is then incised on each side, so as to form an anterior and a posterior flap. Or it may be divided, so as to form two lateral flaps. The incision should reach up to the tumour. These flaps should be held in strong forceps, separated and pulled downwards.

The prominent part of the tumour is then grasped with strong toothed forceps. With retractors the cervix and vagina are opened as much as possible. An incision is then made in the tumour at right angles to its longest axis. One edge is grasped by forceps, and the piece of tumour cut away with scissors or knife below them. Before the portion is removed, a grasp is taken below it with another pair of forceps.

Usually the operation is not attended with much hæmorrhage. What there is comes chiefly from the divided cervix. Forceps should be used to check this. If possible, preliminary ligature of the uterine arteries might be employed in order to diminish bleeding.

The removal of the tumour, piece by piece, is continued until it is entirely taken away.

Sometimes when the lower part of the mass is removed, the upper portion may come away by twisting it.

In some cases more than one tumour may be removed.

If a small opening be made through the uterine wall into the peritoneum, no particular measures need be adopted. If a large one be made, total extirpation of the uterus should be performed. If very extensive destruction of the uterus be caused by the *morcellement*, total extirpation should also be performed.

After the removal of the tumour, all bleeding points in the raw bed should be seized with long forceps. The cavity should be cleaned with an antiseptic douche, and between the forceps an iodoform gauze plug should be placed in the uterus.

After-treatment.—The patient is kept at rest. The vagina is douched daily. In thirty-six or forty-eight hours the forceps and gauze are removed, the uterus being washed out. Ergot is given regularly.

Note.—This operation should only be attempted when there is a definite sub-mucous tumour. The risks of cutting into the peritoneum, of hæmorrhage, sepsis, and shock from prolongation of the operation, are great.

It is impossible as yet, to say whether this operation is safer or more dangerous than abdominal enucleation or hysterectomy.

Fibroids of the Vaginal Portion of the Cervix.—(*a*) *Pediculated.*—These are removed in a manner similar to that employed in the case of pediculated fibroids of the body.

(*b*) *Interstitial.*—These are they which cause a large swelling in the cervix, and tend to grow towards neighbouring parts—*e.g.*, into the broad ligament.

If not too large, the covering should be divided, and enucleation or *morcellement* should be carried out.

Sometimes one has to be satisfied with removing a part of the tumour, the capsule being sewn over the cut end.

In some cases the part left may be gradually pushed downwards by uterine action, so that it can be removed by a second operation.

When a tumour is removed, the resulting cavity may be closed by continuous catgut suture or packed with gauze.

Care should be taken to avoid injuring the bladder or ureter.

Fibro-cystic Tumours of the Uterus.—In these cases the procedure varies, according to the extent of the cystic formation. If there be one pediculated cyst it is removed just as is a sub-peritoneal fibroid. If the cystic disease is extensive, amputation of the uterus or pan-hysterectomy should be performed. To make the mass as small as possible the cysts may be tapped before removal is carried out.

Polypi of the Uterus.—*Fibroid polypi.*—The method of removal of these has already been considered.

Mucous polypi (simple adenomata).—These are removed by twisting of their necks with forceps. Curetting of the uterus should then follow.

Pediculated cystic polypi of cervix.—The base should be ligatured, and the tumour cut away beyond.

Benign papilloma of the cervix.—The base is ligatured and the tumour cut away.

Placental or fibrinous polypi.—These should be removed with a large curette.

Note.—For these conditions the cervix should be dilated when necessary, previous to removal of the mass.

Malformations of the uterus.—*Rudimentary uterus.*—Removal of the appendages by abdominal section may be necessary on account of dysmenorrhœa in some of these cases.

Septate uterus.—The septum should be removed after dilatation of the cervix. It is cut away with a bistoury or scissors.

Atresia of uterus associated with retained menstrual blood.

Careful examination of the patient should be made to determine whether the Fallopian tubes are distended as well as the uterus.

If they are distended, abdominal section should be performed, and the tubes and ovaries should be removed in the manner described on p. 189. If this removal is impossible, possibly the ovaries alone may be removed. The distended tubes may then be aspirated. Sometimes only one can be removed. The other is then aspirated and closed, or it is opened and drained by the abdominal wound. Or it may be so placed as to allow of after-puncture and drainage by the vagina.

When the patient has thoroughly recovered from the abdominal operation the cervix should be opened by a second operation, the patient being placed in the lithotomy position. The contents of the uterus may be aspirated with a small trocar. Then a director should be introduced, and the opening enlarged with a bistoury by radiating incisions,

and also with dilators. All fibrin and solid debris should be carefully removed from the interior.

The uterine cavity is thoroughly washed out, and a hollow glass plug passed into the cervical canal, where it is left for several days, a daily antiseptic douche being given. The glass plug should be moved in the cervix at each douching. In a couple of weeks the patient may rise, and may move about. A glass plug of smaller size may be worn for a couple of weeks, being kept in the uterus by means of a vaginal plug. Afterwards it should be removed. If the uterus is much enlarged at this time, curetting of the cavity may be carried out to stimulate involution. Afterwards dilators should be passed through the cervical canal periodically.

If the tubes are not affected, the opening of the cervix may be carried out at once.

Note.—If the uterus be opened while dilated tubes remain untouched there is danger of rupture of the tubes during the manipulations. This danger arises from the fact that the tubal sac, if fixed by adhesions (and it is in the majority of cases), cannot change its position in keeping with the change in the size and shape of the uterus attendant upon evacuation.

Moreover, if septic infection should follow the opening of the uterus, there is an increased risk to the patient.

Detached uterine horn distended with blood.—The treatment in such a case is to perform abdominal section, and to remove the horn with its tube and ovary just as a large hæmato-salpinx would be removed. If, owing to adhesions removal is impossible, the appendages should be taken away and the horn opened and drained either by the vagina or by the abdominal incision.

Detached horn in which pregnancy has occurred.—For treatment *see* p. 288.

Affections of the Vulva.

Pruritus vulvæ.—Operative treatment must be performed in a certain number of these cases. The patient is placed in the lithotomy position and the vulva made thoroughly aseptic, the hairs being shaved off.

The part affected is then dissected off, the raw surface being closed with continuous catgut suture.

When, as is often the case, the clitoris and adjoining parts of the labia minora are affected, a spindle-shaped mass of tissue extending from half an inch above the clitoris as far down as a point midway between the glans and the urethral orifice, is removed. This mass includes most of the clitoris and part of the labia minora. The wound is closed from above downwards with continuous catgut suture.

Cysts of the Bartholinian glands.—These should be removed. The hairs of the affected side are shaved off. An incision is made through the skin over the cyst. Sometimes it is possible to dissect it out without opening into it. This may be done even if collapse of the cyst take place owing to escape of the contents.

When complete removal is carried out the rawed cavity should be closed with continuous catgut suture.

When the cyst wall cannot be thoroughly removed it should be destroyed with the thermo-cautery, the cavity being then stuffed with iodoform gauze and allowed to close gradually.

Tumours of the vulva.—*e.g.*, fibroma, lipoma, neuroma, &c., should be removed with a bistoury.

Carcinoma of the vulva, if not too widespread, should be removed with a bistoury even though the inguinal glands be

affected, in order to save the patient pain and discomfort at the vulva.

If nodules are diagnosed very early, complete cure may follow removal of the mass.

Pudendal hernia.—Radical cure should be performed according to the methods described in surgical text books.

Abscess.—Abscess in the vulva generally begins in the Bartholinian gland, but it may occur independent of it. It should be freely opened, the lining destroyed with a cautery, and then stuffed with iodoform gauze.

Affections of the Vagina.

Vaginismus.—Operative treatment is generally necessary in this condition.

If the cause be any local irritation—*e.g.*, urethral caruncle —this is removed as described on p. 258; if tender hymen or carunculæ myrtiformes, these are to be cut away, and the vaginal orifice somewhat stretched. Fissures around the vaginal orifice or in the anus are to be divided or stretched.

If no local cause can be discovered, contraction of the sphincter vaginæ occurring reflexly when penetration is attempted, stretching of the vaginal entrance by means of the large Hegar dilators, as well as by the fingers arranged in a cone-shaped mass, should be performed.

Or, the fibres of the sphincter vaginæ may be cut on each side of the fourchette, the ostium vaginæ being afterwards somewhat stretched.

After all of these procedures, a glass tube is worn while the patient lies in bed, and when she walks about, for two or three weeks after the operation.

The outer end of the tube has a rim to which are tied tapes. These pass in front and behind the thighs, and are fastened to an abdominal band.

Cysts of the vagina. — These should be removed if possible. A longitudinal incision is made through the vaginal mucosa over them. The cyst should then be dissected out, and the raw cavity closed with continuous catgut suture. If a communication exists between it and the urethra, the edges should be pared and closed with sutures.

Fibroid tumours.—The vaginal wall and capsule should be opened and the tumour shelled out. When the tumour is pediculated, ligature of the pedicle with removal of the growth should be carried out. If the tumour be extensive, its removal may be difficult owing to its relation to neighbouring structures. Sometimes it is only possible to remove part of the mass.

Carcinoma and sarcoma.—If diagnosed very early the nodule may be entirely removed.

When advanced, palliative measures only can be employed, somewhat similar to those employed in cancer of the cervix.

Atresia vaginæ.—This is operated upon as soon as it is discovered after puberty. Sometimes before puberty, owing to the accumulation of mucus above, the atresia operation may be called for.

Just as when there is atresia of the cervix, the condition of the tubes should be examined. If they are distended, they should be removed first of all. When very slight distension is present, it would be justifiable simply to aspirate the fluid from the tubes, and to close the open-

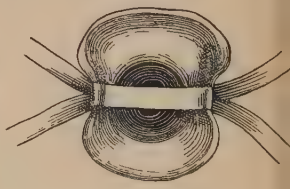
ings, in the hope that they may recover their functional activity.

If an abdominal section be performed for the treatment of the tubes, the vaginal condition should be attended to after the patient has thoroughly recovered.

If, however, it has been found that the whole vagina is wanting, there being no possibility of tunnelling a new slit, nothing can be done after the tubes and uterus are emptied or removed by abdominal section.

When the hymen or lower part of the vagina is atresic, an opening should be made in much the same manner as

1.



2.

FIG. 41.—Vaginal tube.

1. Side view. 2. Outer end, showing mode of attaching straps.

described in atresia of the cervix (*vide* p. 243). The hymen may be cut away.

When the whole vagina is atresic, a new vaginal slit may sometimes be made by tunnelling in the recto-vesical septum. This is carried out with bistoury, scissors, and fingers. Care should be taken not to injure bladder, ureters, or rectum. A sound should be held in the bladder by an assistant during the operation.

The operation is more difficult when there is no accumulation of blood above the atresic portion. In such a case

the uterus should be pushed downwards through the abdominal wall by an assistant, in order that the operator may be better able to work his way to the cervix.

Whenever an atresia is incised, the retained fluid above it is allowed to drain away slowly. The opening is made as large as possible, and a glass tube introduced. The patient is kept in bed until the freshly rawed surface granulates and heals.

Thereafter she should wear the glass plug for a year or more (except at her menstrual periods), and should understand how to remove it, clean it, and give herself a vaginal douche from time to time.

Atresia of one-half of a septate vagina and uterus.—If, with this condition, the Fallopian tube on the corresponding side be at all distended, it should be removed. The atresic vagina should be opened and drained, the septum being cut away. The cervix should then be pulled down with a volsella, and the septum in the uterine cavity removed. Afterwards the vagina should be douched daily with an antiseptic lotion.

Sometimes bands only are found across the vagina. These should be incised and removed.

Affections of the Pelvic Floor.

Rupture of the Perineum.—*Immediate rupture.*—When this occurs during delivery of the child, repair should be performed at once unless the tear is a very slight one.

The raw surface is closed by a continuous catgut suture (No. 3) applied from the bottom of the wound to the superficial parts. Plenty of tissue should be pierced by the

needle, in order that in the softened condition due to pregnancy it may not tear.

Old-standing rupture.—(*a*) Where the anus is not included in the rupture.

The following operation is the best:—

The patient is placed in the lithotomy position, having been carefully prepared beforehand. With a pair of

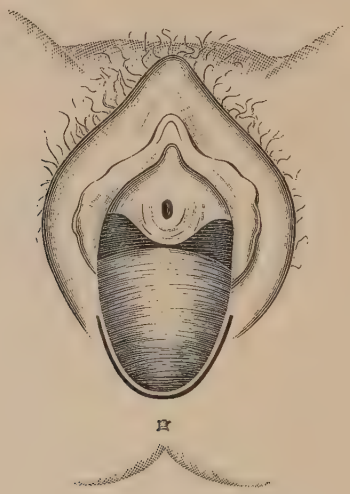


FIG. 42.—Operation for repair of incomplete rupture of perineum. The line of incision is shown.

angled scissors a horse-shoe shaped cut is made between the anus and introitus vaginæ, the sides of the incision running on the inner surfaces of the labia majora.

The incision is extended into the tissues for nearly an inch. The anterior flap is then drawn forwards by a volsella, which grasps it in the middle line. The edge of the

posterior flap is pulled backwards by a volsella attached in the middle line.

In this way a gaping lozenge-shaped raw surface is produced. This is closed from side to side by a continuous catgut suture (No. 3) carried in several stages from the deepest portion of the wound to the skin-surface. The parts are dried and an iodoform suppository is placed in the

FIG. 43.—Operation for repair of incomplete rupture of perineum. The vaginal flap is carried forwards somewhat to expose the raw surface made by incision.

vagina. Antiseptic powder is sprinkled over the vulva and a pad of gauze placed over the wound. A morphine suppository is given *per rectum* and the patient put to bed.

After-treatment.—The urine is drawn off every six hours for four days. The vulva is washed with antiseptic lotion

each day, antiseptic powder being sprinkled over the perineum and a gauze pad placed there afterwards. An iodoform suppository is placed in the vagina. Between the second and third weeks the patient is allowed to rise.

(*b*) Where the anus is involved in the rupture, or, at least, the sphincter apparatus.

A lateral incision is made through the skin on each side, extending from the torn end of the external sphincter

FIG. 44.—Operation for repair of incomplete rupture of perineum. The vaginal flap is carried farther forwards.

forwards on the inner margin of the labium majus for an inch or slightly more. Then another incision is made with sharp angled scissors into the lower or free edge of the recto-vaginal septum. These incisions are then deepened. They result in the formation of four flaps, two anterior or vaginal, and two posterior or anal.

These are held at the corners with artery forceps

while the raw surface is incised as much as is thought necessary.

The vaginal flaps are then turned forwards and the anal backwards, so that a large quadrilateral raw surface is exposed, in the lower angles of which the torn ends of the external sphincter are found.

The anterior or vaginal flaps are next brought together in the middle line by a few catgut sutures tied on the vaginal

FIG. 45.—Operation for repair of incomplete rupture of perineum. Appearance of perineum at end of operation.

surface. The posterior or anal flaps are also stitched together in the middle line by several catgut sutures tied on the bowel surface.

The quadrilateral raw surface is then closed from side to side by a continuous catgut suture applied in several

stages, great care being taken to approximate the torn sphincters.

At the end of the operation a new perineum exists, the anus has been repaired and the introitus vaginæ diminished.

After-treatment.—The same as after the last operation.

On the fourth day a saline aperient should be given, olive oil or glycerine being injected into the rectum carefully

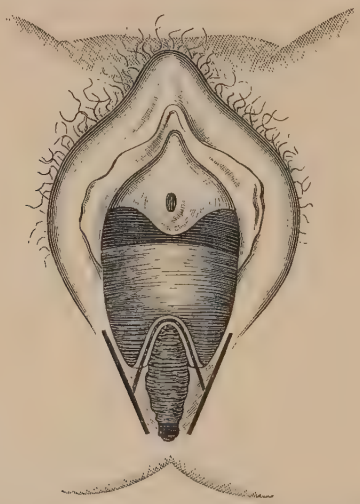


FIG. 46.—Operation for repair of complete rupture of perineum. The line of incision is shown.

before the bowels move. Thereafter on every second day a little opening medicine should be given. The patient lies in bed for about eighteen or twenty days ordinarily. If suppuration has occurred so that healing is longer delayed she must rest for a longer period.

Downward displacements of the pelvic floor.—(1) *Anterior enterocele.*—When a pessary fails to support the prolapsing part an operation should be tried. The most thorough method is to perform an anterior colpotomy without opening into the peritoneal cavity if possible, rawing the anterior surface of the cervix and the posterior wall of the bladder, and then stitching them together. An oval shaped flap of the anterior vaginal wall, extending from

FIG. 47.—Operation for repair of complete rupture of perineum. The rectal flaps have been turned down and sutured together; the vaginal flaps have been turned forwards and sutured together. A large lozenge-shaped raw surface is thus left exposed. This is closed from side to side with continuous catgut suture.

near the anterior fornix to near the urethral orifice, should then be removed, and the raw surface closed by continuous catgut sutures. Care must be taken not to injure the ureters.

(2) *Posterior enterocele.*—Operation is not so satisfactory in this condition. A vertical mesial incision should be made in the posterior vaginal wall, the peritoneum should be stripped upwards as high as possible, and the anterior wall of the anus should be stitched to the vaginal wall, after a portion of the latter has been cut away parallel with the incision. In this way a new recto-vaginal septum is formed.

(3) *Prolapse of the uterus.*—In slight degrees of this condition treatment by pessaries is usually efficacious.

In more marked cases where the uterus has descended along with portions of the anterior and posterior vaginal walls, pessary treatment may suffice, but it is advisable to employ operative measures.

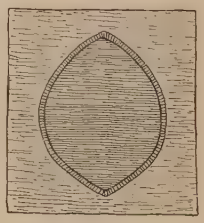


FIG. 48.—Anterior colporraphy. The diagram shows the oval raw surface on the anterior vaginal wall.

After careful preliminary preparation of the patient, she is placed in the lithotomy position. If the uterus is enlarged to any extent (and it usually is in these cases), it should be curetted, and the cervix amputated in order to stimulate the organ to involution.

Then an anterior colporraphy is performed in the following manner:—The cervix is pulled downwards and backwards and held. The anterior vaginal wall is grasped with a volsella above the urethral orifice and held steady. An oval incision is made through the vaginal mucosa as large as is required, the long diameter being in the long axis of the vagina. The size varies according to the

degree of prolapse. A vertical incision is made from end to end of the oval through the mucosa, and each lateral flap of mucosa is dissected off until the oval raw surface is left. This is then closed from side to side by a continuous catgut suture (No. 2 or 3) passed in stages.

Next, the perineum should be repaired in the manner described on p. 250.

In this way the uterus is made smaller; the vagina is narrowed by the constriction resulting from the colporraphy, and a new, strong thick perineum is formed.

In more marked cases where the posterior vaginal wall is much prolapsed and stretched, it is best, after doing the anterior colporraphy, to perform a posterior colporraphy, along with an operation to repair the perineum—*e.g.*, a colpo-perineorraphy. Various methods are employed. The following may be adopted:—

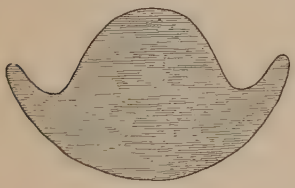


FIG. 49.—Colpo-perineorraphy. The diagram shows the rawed surface made on the posterior vaginal wall and perineum.

An anterior spatular speculum is introduced to pull up the anterior vaginal wall. The vulva is widened by means of retractors. The middle of the posterior wall of the vagina, about 1½ in. above the perineum, is held with a volsella. Below this on each side the lateral edges of the same wall are held with forceps. In this way the lower part of the posterior wall is put on the stretch. Then with a knife an incision is made on the posterior vaginal wall and perineum, the outline being that indicated in Fig. 49. The flap is then dissected off, and the raw surface closed from side to side by a continuous

catgut suture. The vaginal portion should be closed before the perineal part is stitched.

After-treatment.—Practically the same as after a tear of the perineum.

In the most marked cases the following operative procedures are recommended by some—viz., shortening of the round ligaments, stitching the uterus to the anterior abdominal wall (*vide* p. 212). These methods are still on their trial.

Affections of the Urethra.

Prolapse of the mucosa.—Where the use of astringents is of no avail, or where the prolapse is extensive, the prolapsed portion should be cut away, and the margin of the mucosa should then be stitched to the vaginal edge of the raw surface with fine catgut sutures.

Sometimes contraction follows this operation, so that dilatation may be necessary.

Urethrocele.—If this be in the form of a diverticulum attached to the urethra, an incision should be made over it, the diverticulum removed, the urethral opening closed, and the wound stitched with catgut sutures.

If there is a general bulging of the lower wall of the middle portion of the urethra, a vertical mesial incision is made into this portion, the prolapsing portion of the urethral mucosa is cut away, and its edges closed with fine catgut. The vaginal edges of the wound are then somewhat trimmed and afterwards closed with catgut sutures.

Caruncle.—This is removed by means of the Paquelin cautery at a dull-red heat. If there is after-hæmorrhage, a

large iodoform gauze plug should be placed in the introitus vaginæ, so as to press against the urethra.

Other growths.—These may be removed by the curette, by ligature and division with a knife, by a polypus snare. If necessary the urethra may be dilated or even slit up.

Foreign bodies in the urethra.—These may be removed with long narrow forceps. If necessary the urethra may be slit up.

Fissure of the urethra.—This is difficult to treat, being situated at the inner end. At first dilatation of the urethra should be tried. The function of the sphincter is destroyed for a time, and, during this period of rest, the fissure, which has been stretched, has a chance to heal.

Along with the dilatation the application of the cautery to the fissure by means of an endoscope is made by some operators.

If these methods fail, the establishment of a vesico-vaginal fistula for a time may be necessary.

Stricture.—Dilatation must be carried out with Hegar's dilators. Cicatricial bands which do not yield to this method must be divided with a narrow bistoury or a special dilating urethrotome.

If cicatricial bands exist towards the vaginal surface, these may be divided by means of incisions through the vaginal mucosa.

Dilatation.—For this one or more longitudinal furrows in the urethral mucosa may be burned with a Paquelin cautery.

Affections of the Bladder.

Cystocele.—Besides the employment of a vaginal pessary for this condition, anterior colporraphy may be performed.

Cystitis.—In obstinate cases of this condition when the ordinary medical treatment is insufficient, continual drainage of the bladder may be tried. This should be done by means of the urethra, which must be dilated with Hegar's dilators. The action of the muscles which compress the urethra is interfered with for a time. If the muscles regain their power too soon, another dilatation should be performed.

The patient remains in bed. During the day she may rest against an inclined plane, so that the back is somewhat elevated. Twice daily a weak antiseptic douche is given—*e.g.*, boracic, and iodoform bougies should be passed into the bladder cavity.

If too much dilatation be made, permanent paralysis of the urethra may remain. A diameter of 20 m.m. is the usual limit in an adult.

When drainage by the urethra fails to cure the case an artificial opening should be made through the anterior vaginal wall.

The patient is placed in the lithotomy position. The cervix is pulled down, and the anterior vaginal wall held steady with volsellæ.

A sound is passed into the bladder, the point being made to press the base forwards just above the inner end of the urethra. A mesial incision is then made through the anterior vaginal wall and the base of the bladder, the knife cutting on the point of the sound. With a pair of scissors this incision is lengthened upwards for about three-quarters of an inch. A finger is introduced to feel the condition of the bladder wall. If any crystals of lime are attached to the wall, they should be removed. The bladder is next

washed out. Then, with small full-curved needles and catgut sutures (No. 2), the vesical and mucosal edges of the wound are united all around the opening.

The patient remains in bed, daily vaginal antiseptic douches being given.

When the patient is cured, the fistula is closed, according to the method described on p. 267.

Vesical calculus.—Small stones may be removed through a dilated urethra by means of a pair of slender forceps. If necessary, a tubular speculum may be used.

A stone of moderate size may be crushed in the ordinary manner, the debris being washed out.

If there be much cystitis, or if the stone be too large or too hard to allow of crushing, it must be removed by an opening through the anterior vaginal wall or by supra-pubic cystotomy. The former method is to be chosen, save when it is not possible to adopt it. The patient is placed in the lithotomy position, the vagina well exposed with specula, the cervix pulled down, and the anterior vaginal wall fixed. If necessary, pass a sound into the bladder as a guide to the knife. The incision is made in the middle line as long as is necessary. The stone is then removed *en masse*. It may be crushed if it is too large to extract otherwise. The interior of the bladder should be carefully washed out, and then explored with the finger. If there be little or no cystitis, the wound should be closed with catgut sutures (No. 2 or 3), as in the case of repair of a vesico-vaginal fistula (*vide* p. 268). The after-treatment is the same as in the case of a fistula repair.

If marked cystitis be present it may be necessary to close only the upper part of the wound, leaving the lower part

open to act as a drain for a few weeks. When the patient has recovered, complete closure can be carried out.

Foreign bodies.—These are removed according to the principles observed in the removal of stone.

Tumours of the bladder.—The treatment depends on the size and situation of the tumour. Sometimes small pedi-culated growths may be twisted off through the dilated urethra.

Larger growths may be removed by means of a vertical mesial incision through the anterior vaginal wall and base of the bladder. The tumour should be removed with the cautery at a dull-red heat. The opening into the base may then be closed.

For large growths the operation of supra-pubic cystotomy may be employed. This operation is performed as follows: —The patient is prepared as for an abdominal section. She is placed in the dorsal or Trendelenburg position. Some operators distend the bladder or rectum with air or warm sterilised water (99° F.) in order to push up the peritoneum as much as possible. Others think this unnecessary. It may be dangerous to distend the bladder when there is disease in its wall. If it be not distended, it should at least be filled.

A vertical mesial incision two or three inches in length is made through the skin and superficial fascia immediately above the symphysis. It is then carried transversely across the top of the pubes. The origins of the recti and pyrami-dales muscles are divided a short distance above the bone. The thumb and finger are passed behind the symphysis, the peritoneum being separated somewhat from the bone if it be attached, and the extra-peritoneal tissues in the region of the apex of the bladder drawn upwards.

A loop of silk-worm gut or of silk is now passed through the thickness of the muscular wall at the lowest part of the bladder which can be reached behind the symphysis. Another is passed higher up just below the attachment of the peritoneal reflection.

The wall of the bladder is divided vertically between these fixation loops until the vesical mucosa is seen as a bluish membrane.

All bleeding is checked and the mucosa is incised with a bistoury. The finger is quickly introduced to prevent escape of the contained fluid, and the bladder is explored. The opening may be enlarged according to requirements of the case.

Sometimes it may be necessary to resect a triangular portion of the symphysis subperiosteally in order to obtain room. The base of the triangle is the upper margin of the symphysis.

After the operation is finished, the bladder wall is closed by two rows of catgut sutures. One of these secures the mucosa, the other the muscular coat and the overlying cellular tissue.

The divided ends of the recti and pyramidales are brought together and the outer wound closed save at the lower end where an iodoform gauze drain is placed in the wound.

After-treatment.—Practically the same as after a vesico-vaginal fistula repair. In addition the abdominal wound must be cared for.

When the tumour cannot be removed it is sometimes advisable to remove as much as possible, the raw surface being cauterised. In such cases it may be necessary to

establish a permanent fistula either by the vagina or by the abdominal wall.

Malformations of the urethra and bladder.—*Atresia urethræ.*—If this be due to a membranous septum, puncture cures the condition. When part or whole of the urethra is absent, the child often dies in utero or soon after birth. If with the condition a urachal fistula exists, an attempt may be made to channel a new urethra. If this be successful the urachal fistula in the abdominal wall may be closed.

Defect of urethra.—When the inferior wall of the urethra is absent, a plastic operation is performed. Longitudinal flaps are made on each side of the middle line. They are turned inwards, their raw surfaces being stitched together. In this way the epithelial surface is made to form the lining of the newly formed urethra. Their upper ends are joined to the lower end of that portion of the urethra which is intact.

After healing is complete dilators must be passed from time to time to prevent too great contraction.

Extroversion of bladder.—Previous to any attempt at operative treatment, the health of the patient should be made as good, and the local conditions as favourable as possible.

If the urethra be deficient it should first of all be restored by a plastic operation.

Afterwards, the malformation in the lower abdominal region is closed. If there be a mere fissure the edges should be pared and stitched together. If there be considerable deficiency in the anterior abdominal wall, a plastic operation should be undertaken.

Flaps are made from adjacent parts of the abdominal parietes and turned inwards over the opening, their edges being stitched together and to the pared edges of the opening.

In this way the skin surface forms the new anterior wall of the bladder.

The flaps may be taken from above and from each side of the opening, or one large one may be taken from an inguinal region.

Some prefer, after making the flaps, to cover the raw surface with skin grafts. Afterwards at a second operation the edges of the flaps and of the opening are brought together.

If the skin-grafting is not undertaken, it is necessary to dress the raw surface carefully with iodoform collodion.

Urinary fistula.— *Vesico-vaginal fistula.*—It is to Marion Sims and to Simon that the chief credit is due for the best method of treating this condition—viz., the formation of raw surfaces at the edges of the fistula and their closure by means of sutures. The plan followed by these operators was to remove a strip all around the margin of the fistula, extending from the vesical to the vaginal mucous membrane. The differences between their incisions are brought out in Fig. 50.

Owing to the modifications in operative treatment which have been introduced in recent years, the methods of Sims and Simon have been considerably improved upon. The varieties of treatment may best be described in relation to the different sizes as well as to the situations of the fistula. These have been fully described by me in the *Edinburgh Hospital Reports*, vol. iii.

The fistulæ may be classified as follows :—

Very small.

Medium.

Large.

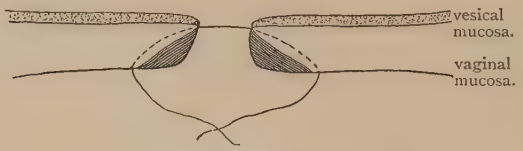
Very large.

(*a*) With non-cicatrisation of lower margin to pubes.

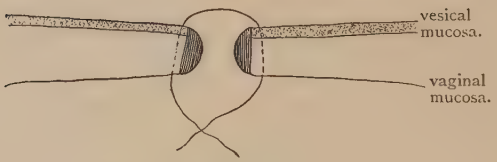
(*b*) With cicatrisation of lower margin to pubes.

Utero-vesico-vaginal.

Utero-vesical.



Sims' operation.



Simon's operation.

FIG. 50.

Very small fistulæ.—These are only large enough to admit the passage of a probe or sound.

The best method of repairing these openings is as follows :—The patient is placed in the lithotomy posture, the cervix uteri drawn down and the anterior vaginal wall exposed as in the operation of anterior colporraphy. A round or oval flap of vaginal mucous membrane, about $\frac{3}{4}$ in. in diameter, is then dissected off, the fistulous opening being

left in the centre of the raw surface. This surface is then closed with continuous catgut suture until only a longitudinal mark is left on the anterior vaginal wall, the fistula being covered up by a thick mass of tissue.

Medium fistulæ.—By these I mean the cases in which there has been little loss of tissue, so that it is possible to bring the edges fairly close together.

It is not a good principle to remove strips of tissue in order to produce a raw surface. The flap method of

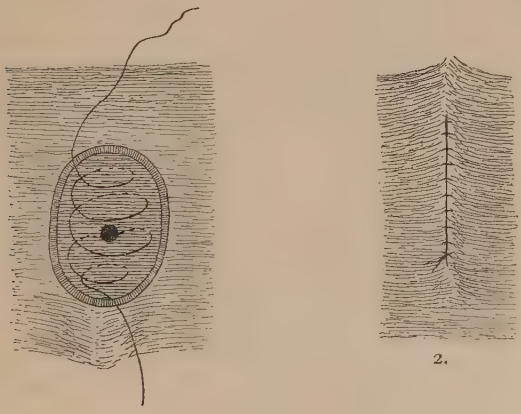


FIG. 51.

1. Raw surface with fistula in its centre, and first stage of continuous suture. 2. Appearance of vaginal wall after closure of raw surface.

Walcher, or, as it is called by the French, *autoplastic par dédoublement*, should be carried out.

The patient is placed in the lithotomy posture, the cervix pulled down, and the edges of the fistula steadied with forceps.

The margin of the opening is then split all round, to the depth of about a quarter of an inch. In this way vesical and vaginal flaps are formed. The former are pushed towards the bladder and the latter pulled outwards. The large raw surface thus exposed is then closed from side to side by

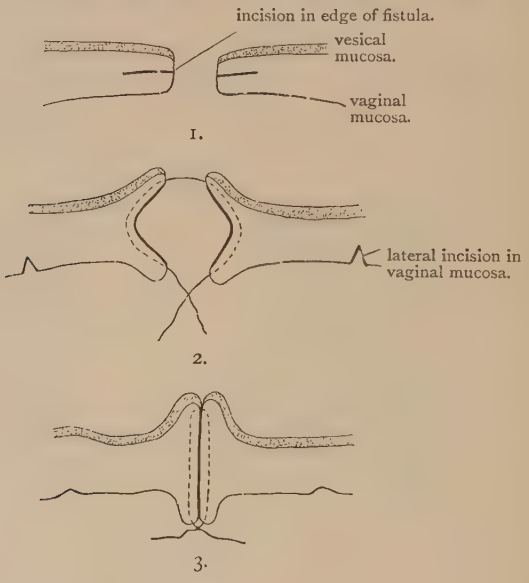


FIG. 52.

1. Edge of fistula with incision. 2. Flaps separated and suture passed. 3. Raw surface of flaps approximated.

catgut sutures applied either continuously or in a series. The fistula is thus completely closed.

If there be much tension on the stitches, it is best before closing the fistula to make a vertical cut about half an inch in length through the vaginal mucosa on each side of the

fistula. After the closure of the fistula, these lateral incisions may be left to heal by granulation, or they may be closed by sutures passed at right angles to the original line of incision.

Large fistulæ.—In these there has been some loss of tissue so that the edges cannot be brought together.

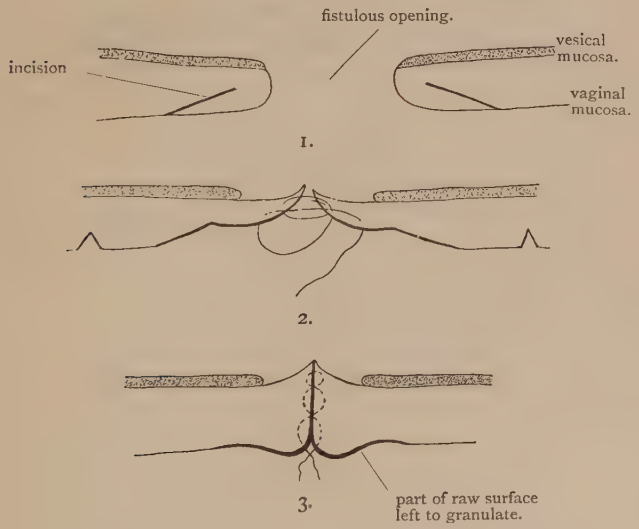


FIG. 53.

1. Incision around fistula. 2. Flap turned inwards and suture introduced. 3. Raw surface of flaps approximated by means of sutures.

In these cases the following plan should be adopted :—

An incision is made through the vaginal mucosa at a distance from the margin of slightly more than half the width of the fistula. The mucosa within the incision is then dissected nearly to the edge of the fistula so as to form a flap. This is turned inwards so as to bridge across the

fistula. The approximated edges of the flap are joined with catgut sutures, and its rawed surface is closed as much as possible with continuous catgut. In this way the new base of the bladder is formed by turned in vaginal mucosa.

The lateral incisions for relieving tension may be used in these cases as recommended in the last described operation. The large raw surface cannot usually be completely closed. The unstitched part may be left to heal by granulation.

Very large fistulæ.—(*a*) With non-cicatrisation of margin to pubes.

Mackenrodt's operation is undoubtedly the best.

The cervix is pulled down and steadied along with the vagina by means of volsellæ.

A vertical mesial incision is made through the anterior vaginal wall and the base of the bladder, continuous with the fistula. By this incision an opening is made to extend from the cervix to the inner end of the urethra. The vaginal is then separated from the vesical wall for a short distance all around the fistula. The bladder is next separated from the cervix at the upper end of the incision. The edges of the bladder wall are then brought together by catgut sutures from cervix to urethra. Then the vaginal edges are stitched together. If they cannot be easily closed at the upper end, the cervix is to be drawn down so that its rawed posterior surface may be stitched to the flaps.

(*b*) With cicatrisation of lower edges to pubes.

Schauta's plan should be adopted here.

On the side of the cicatricial union, a vertical incision is made through the labium major, being carried as deeply as the descending ramus. Then with fingers and dissector the wall of the vagina along the cicatrised portion is separated

from the bone. The outer wound is next stuffed with gauze until the edges of the fistula are rawed and closed. Then the outer wound is closed.

Utero-vesico-vaginal fistulæ.—In these cases the cervix is torn through as far as the vaginal wall where there is an opening into the bladder.

The following operation should be adopted :—The anterior fornix is divided transversely close to the cervix. The bladder is next stripped from the cervix so that the fistula can be well exposed. The opening in the bladder is then closed with sutures which bring into apposition the raw surfaces around the fistula ; the cervical tear is also repaired. Afterwards the anterior fornix is closed.

Utero-vesical fistulæ.—In these there is a communication only between the bladder and the cervical canal. The operation just described should be employed in these cases.

Urethro-vaginal fistulæ.—These may be closed by either of the methods described on pp. 266-67.

When a urethral as well as a vaginal fistula exists, the former should be closed first.

Uretero-vaginal fistulæ.—Different methods are employed for the closure of these fistulæ.

Pozzi's flap-operation is a good one. A transverse incision is made through the vaginal mucosa at the level of the fistula, extending outwards on each side for about three-eighths of an inch. At each end an incision is made at right angles. Each flap is dissected back for about three-eighths of an inch. They are raised and the fistula is seen in the centre of the raw surface. The flaps are then drawn together their raw surfaces being in apposition. Stitches are carefully applied.

Landau adopts another plan. If there be no large opening into the bladder in connection with the fistula, he makes one by the removal of an oval strip in the direction of the ureter. A fine elastic catheter is passed into the ureter, and carried into the bladder through the urethra. A raw surface is made around the fistula, and then closed with stitches, care being taken not to pass them around the catheter. The catheter is left *in situ* for several days.

Uretero-cervical fistulæ.—These cannot be repaired successfully. Closure of the vagina or removal of the kidney on the affected side may be recommended.

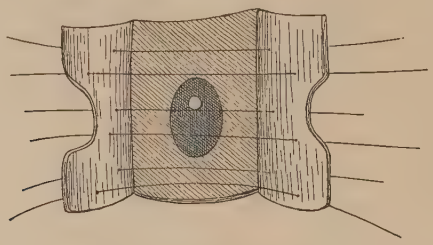


FIG. 54.—Pozzi's method of closing a uretero-vaginal fistula.

Incurable urinary fistulæ.—Closure of the vagina or kolpokleisis may be recommended. First of all, if there be no large communication between the bladder and vagina, one should be made by excising a portion of the walls. The opening should be about two-thirds of an inch in diameter. After the edges of the incision have healed closure of the vagina is carried out. A circular ring of vaginal mucosa is dissected off, half an inch or more in width. The raw surfaces are brought together with silk-worm gut.

The patient is placed in bed and treated as after a vesico-vaginal fistula operation.

When healing takes place it is evident that the upper part of the vagina has been transformed into a diverticulum of the bladder. Menstruation thereafter occurs by way of the urethra.

Special points to be observed.—A fistula caused by labour is best operated on two months after delivery. The lithotomy position is the most suitable. Sometimes the genu-pectoral may be chosen.

All these operations should be preceded by the most thorough disinfection of the bladder, vagina, and uterus. During the operation strict asepsis should be observed.

Catgut is sufficient for all sutures, Lister's chromic gut, Nos. 2 and 3, being serviceable. It must be thoroughly soaked in a warm antiseptic solution before use. The best needles for fistula cases are Martin's small full-curved variety. They should be used with his simple holder.

After the operation the bladder should be drained, *per urethram*, by a soft metal catheter.

One should be used at night, and another during the day, the unemployed one being kept in an antiseptic solution. It should be passed carefully so as not to injure the healing wound in the base of the bladder.

If hæmorrhage occur from the wound, vaginal plugging may be necessary, if a hot douche does not check it. If the bladder fills with clot, the urethra should be dilated and the clot broken up with a wire loop.

When hæmorrhage cannot be stopped, the vagina must be dilated, and fresh stitches applied.

Should the ureter be hurt, or included in a ligature, there is pain in the loins, vomiting, and rise of temperature. In

such a case the offending ligature must be removed. If this be not done it will ulcerate through the ureter.

On the sixth day the patient is allowed to make water at short intervals. For the first eight days iodoform pessaries are introduced daily into the vagina. Afterwards an antiseptic douche is given with a double catheter. Ammonium benzoate or salol may be administered by the mouth.

Incontinence of urine may last after the fistula has been closed, from loss of tone in the muscular fibres surrounding the urethra owing to disuse.

For this condition various medical means are tried—*e.g.*, electricity, strychnine, massage, hot douches. Some recommend the removal of a small amount of tissue in order to diminish the calibre of the outer portion of the urethra.

Affections of the Rectum and Anus.

Rectocele.—If this condition of bulging of the anterior rectal wall, along with the posterior vaginal wall, cannot be satisfactorily treated with a pessary, it is well to perform either a posterior colpo-perineorraphy, or to repair the perineum by the operation described on p. 250.

Prolapse of the rectum.—When reducible, Robert's operation may be performed. The patient is placed in the lithotomy position, the bowel is carefully cleansed and reduced.

A mesial incision is made into the skin just in front of the coccyx. With a finger the posterior connections of the bowel are separated. Then with a bistoury a triangular piece of tissue is removed including skin, cellular tissue and sphincter; the base of the triangle is the margin of the anus.

Next a triangular piece of the posterior bowel wall is removed, the apex being about three inches from the anus. The edges of the rectal incision are then tied with catgut sutures on the mucosal surface. The outer wound is then closed. Afterwards, iodoform pessaries should be passed into the anus daily.

In irreducible cases Mikulicz's plan may be tried. The outer covering of the prolapsed portion is divided transversely in its anterior half by an incision from two-fifths to three-fifths of an inch from the anus. Then an incision is made on the posterior half at from three-eighths to six-eighths from the anus. If a hernia of small intestine be found on reaching the peritoneum, it should be reduced, the sphincter ani being cut if necessary to effect this.

A strip of the anterior portion of bowel wall is dissected off, and the edges of the raw surface are brought together with sutures. The same procedure is carried out on the posterior position. Then the gut is reduced, and iodoform pessaries introduced.

Fissure of the anus.—A good plan consists in passing a tenotomy knife under the base of the fissure, and cutting through it, dividing the fibres of the sphincter close to it.

Equally good is the plan of stretching the sphincter, so as to paralyse it for a few days.

Simple polypi.—These may be removed by drawing down the tumour, applying a pair of forceps to the base of the pedicle, and cutting away the tumour outside the forceps. The latter are left attached for two or three days. Other operators prefer to ligature the pedicle.

Hæmorrhoids.—When operative treatment is to be carried out, different procedures may be adopted.

The ligature method is a good one. The pile is drawn down with forceps, and separated with scissors from the subjacent tissues. The mass is then ligatured with strong silk at the base. The safest ligature is a double-interlacing one. The mass may then be returned and allowed to slough away, or the part outside the ligature may be cut off. Iodoform and morphine suppositories are to be placed in the bowel daily.

When an external pile, only, exists and is very painful from the presence in it of a firm blood clot, relief is at once given if the clot be shelled out.

In bad cases Whitehead's operation is very effective. An incision is made round the anus at the junction of the skin and mucous membrane.

The hæmorrhoidal mass is dissected off the sphincter, and is cut away. The edge of the mucosa is then sutured to the skin.

Traumatic recto-vaginal fistulæ.—The same principles are to be observed as have been noted in the repair of vesico-vaginal fistulæ.

Thus a posterior colporraphy may be sufficient to bring about closure. The *dédoublement* method is valuable in some cases. When the fistula is low in the recto-vaginal septum, it is best to divide the perineal body in the middle line below the fistula and then to repair the parts as in the case of a complete tear into the anus.

Fistula in ano.—If the tissue around the fistula is in a healthy condition the following plan may be carred out:—

A probe is passed to the top of the fistula into the bowel.

With a bistoury the tissues are divided from the anus to the probe. Any secondary sinus or fistula is then opened up and the fistulous surface is curetted until it is raw. The wound and the bowel are thoroughly cleansed with an antiseptic and then the raw surface is completely closed with continuous catgut or with interrupted sutures. Morphine and iodoform suppositories are passed daily into the bowel.

When the tissues are not healthy enough to ensure healing, it is best, after incision and curetting, to pack the cavity with iodoform gauze, and to allow gradual healing from the depth of the wound to occur.

Cancer of the lower part of the rectum.—Extirpation should be tried in early cases.

There are two methods of performing this operation :—

1. *By resection of the coccyx and part of the sacrum.*—The patient is placed on her left side. A crescentic incision is made over the sacrum, reaching from the posterior part of the right sacro-iliac joint to the left of the anus. When the bone is exposed the structures attached are divided and then the sacrum is divided transversely with forceps or chain-saw below the second lowest sacral foramen. The rectum is then separated from surrounding tissues near the anus.

If possible, the peritoneum should not be opened, but should be stripped upward off the bowel. If it be necessary to open into the peritoneum, the bowel should be drawn down after this is done and the opening should be closed with sutures well above the disease.

The rectum, from the anus upward, is thoroughly separated from surrounding structures.

Two courses may now be carried out :—

(*a*) In the one case, the lower part of the rectum contain-

ing the diseased portion may be entirely removed and the anus closed. The end of the bowel above the line of division is then drawn backwards and stitched to the skin edges below the sacrum, thus forming an artificial anus. The rest of the wound is stuffed with iodoform gauze and allowed to heal slowly.

In such a case, if the posterior vaginal wall be infiltrated, it may also be removed.

All glands affected alongside the bowel must be removed.

(*b*) In the other case, the piece of rectum containing the disease is removed and the two ends of the bowel are then stitched together, the rest of the wound being stuffed with iodoform gauze.

When there is plenty of bowel to pull down, Kocher's plan of suturing it may be tried. Before the division of the gut above the disease a ligature is placed around it just above the line of incision.

The bowel is then cut below this ligature and at the top of the internal sphincter. The mucosa of the anus is then stripped downwards and removed.

Then, by means of the ligature, the end of the rectum is drawn down through the anal canal, to which it is stitched with a number of sutures. The protruding part of the rectum is cut off below the ligature, which is left attached, and allowed to drop off of its own accord. In this way the bowel-contents are kept from infecting the wound. The wound is then stuffed with gauze, which is brought out at the lower end, the skin edges of the upper portion being brought together with interrupted sutures. In three or four days the gauze may be removed, the cavity washed out, and fresh gauze inserted.

2. *By a parasacral incision.*—The patient is placed in the lithotomy or left lateral position. An incision is made from behind the anus to the upper end of the gluteal cleft, and thence to the left as far as the posterior inferior iliac spine The tissues attached to the left edge of the coccyx and lower part of the sacrum are divided. The rectum is now freed from surrounding tissues, as above described. At this stage it is a good plan to plug the rectum as high as possible with iodoform gauze. To exercise traction on the rectum in freeing it, a loop of gauze may be passed around it.

With this incision the coccyx may be removed if necessary.

After removal of the diseased part, the bowel end may be brought to the anus and treated as above described.

Note.—In these cases the operation should be preceded by the most careful emptying and cleansing of the bowel.

When the bowel first moves a few days after the operation, opening medicine should be given, and an oil or glycerine enema administered before the motion.

Coccygodynia.—The treatment of this condition varies according to the causes.

In some cases pelvic inflammation, uterine or ovarian displacement, is associated with the pain complained of. In other cases the affection seems to be neuralgic in nature, and not associated with physical change. In other cases the pain is distinctly associated with lesions of the coccyx or ligaments attached to it.

In the first class of cases the existing pelvic condition should be treated. In the second class Faradic electricity should be employed, one electrode being placed on the

coccyx and the other on the sacrum. Two to eight applications may suffice. The strength of current should be increased from time to time.

In the third class of cases, extirpation of the coccyx should be carried out. An incision is made through the skin, the bone is separated from the soft tissues attached to it, and is then divided transversely by a chain saw or by bone forceps.

Ectopic Gestation.

The treatment varies according to the nature of the condition.

1. *Unruptured tubal gestation.*—In the case of infundibular and ampullar tubal gestation in which no rupture has taken place either into the peritoneal cavity or broad ligament, abdominal section should be performed. If the case is an early one, the pregnant tube is removed in the same manner as described in connection with tubal distensions (*vide* p. 189). The tube should not be ruptured if possible. When the swelling is so matted down by adhesions that it cannot be raised up, the ovarian artery in the outer part of the broad ligament should first be ligatured. Afterwards the broad ligament and tube should be secured by ligatures placed alongside the uterus. The tube may then be cut from its uterine attachments. The lower attachments are then ligatured, and the tubal swelling removed.

When the pregnant tube is incarcerated in the pouch of Douglas, it may be necessary to draw off the *liquor amnii* with an aspirator before the swelling can be pulled up towards the abdomen.

In advanced cases of pregnancy the treatment is much

the same. The tube may be lifted out *en masse*, or there may be preliminary emptying of the liquor amnii.

In the majority of instances, where, owing to adhesions, removal of the whole sac is impossible, the treatment must be the same as in the sub-peritoneo-abdominal variety.

It is important in all cases of abdominal section for ectopic gestation not to neglect the early ligature of the ovarian artery on the affected side as it enters the broad ligament. Sometimes, as well, it may be possible to secure the outer part of the uterine artery, if not by ligature, at least temporarily with forceps.

Sometimes it is beneficial, also, to secure the vessels close to the uterus by placing a pair of forceps on the broad ligament.

In the case of interstitial tubal gestation, it is sometimes possible to dilate the cervix, to divide the partition between the gestation sac and the cavity of the uterus, and afterwards to remove the fœtus and secundines. If the fœtus be too large to be safely removed through the opening, it should be broken up. Great care must be taken, in removing the placenta, not to tear the wall of the gestation sac, which may be very thin in some parts.

After the emptying of the uterus, the gestation sac should be stuffed with iodoform gauze for about three days, in order to check hæmorrhage, and to bring about uterine contraction.

When this method is impossible, owing to the shape and situation of the uterus, or the size of the vagina, abdominal section must be carried out.

In the case of a very early pregnancy it might be possible to empty the gestation sac and to close the cavity, as after

the removal of an interstitial fibroid. The appendages on the affected side should be removed at the same time. During the carrying out of this plan the broad ligaments should be temporarily secured with forceps, in order to check bleeding.

If the pregnancy be advanced, removal of the whole uterus should be carried out as described on p. 233.

2. *Cases of tubal pregnancy which have ruptured into the peritoneal cavity.*—If this occurrence is accompanied with symptoms of hæmorrhage and shock, abdominal section should be performed as soon as possible. The rupture should be sought for, and all bleeding stopped by means of forceps or ligatures. The gestation sac should then be removed, the ovarian artery being first of all ligatured as it enters the broad ligament.

If much blood has been lost an intra-venous or sub-cutaneous injection of saline solution should be given. The peritoneal cavity should be carefully cleansed.

If the rupture take place in an interstitial gestation, the treatment is the same as in cases of unruptured interstitial gestations where abdominal section is employed.

If there are no acute or severe symptoms at rupture, the case should not be allowed to drag on for weeks, as is often the practice. Abdominal section should be performed and the sac should be removed.

In some cases no symptoms whatever occur at time of rupture. The membranes escape with the fœtus. They become attached to the peritoneum, thus forming a secondary gestation sac in which the fœtus lies, the placenta remaining in the tube. The gestation continues to grow. Full particulars of this form are given in my monograph on

"Tubo-Peritoneal Ectopic Gestation," and in my book "Ectopic Pregnancy."

In such a case, advice is apt to be sought only when pregnancy is advanced.

Abdominal section should be performed. The secondary sac is opened and the fœtus removed, the cord being tied close to the fœtus. If the amnion can be separated easily as much as possible should be removed.

If it be possible to remove the primary gestation sac *en masse*, this should be carried out after ligature of the broad ligament below it. If it be too fixed with adhesions, the ovarian artery should be ligatured at the outer part of the broad ligament. No attempt should be made to separate the placenta. The secondary sac should be stuffed with iodoform gauze according to Mikulicz's plan.

After four or five days, the patient should be anæsthetised and the gauze removed. An endeavour should be made to take away the placenta and the rest of the cord. In doing this there may be little or no bleeding.

After its removal the cavity is again stuffed with gauze. This is gradually diminished in size as the cavity shrinks.

Should symptoms of septic absorption develop before the fourth day, it is best to remove the gauze and to endeavour to remove the placenta though there is risk of bleeding.

3. *Tubal pregnancy which has ruptured into the broad ligament.*—At the time of rupture, the case should be treated as one of hæmatoma. Absorption and gradual disappearance may take place.

If the gestation in such a case continue to grow, giving rise to the subperitoneo-pelvic or subperitoneo-abdominal gestation, abdominal section should be performed. If the

pregnancy is not older than four months, the mesial incision is made.

Entire removal of the sac or of the sac and uterus may be possible. If not, the ovarian artery is ligatured in the usual manner, and the outer part of the uterine if possible. Then one or other of the following plans may be carried out:—The edges of the sac may be stitched to the edges of the abdominal incision, the fœtus, placenta and membranes removed, and the cavity of the sac stuffed with iodoform gauze, the remainder of the abdominal wound being closed. After three or four days the gauze is changed.

Or, after stitching the sac to the abdominal wall, the placenta may be left *in situ*, the amniotic cavity being stuffed with gauze. After four or five days this is removed and the placenta is separated. If there is bleeding, separation should not be carried out for several days longer.

Sometimes when the sac wall is too thin to be stitched to the abdomen, and when it tears easily, the vessels of the broad ligament should be ligatured as completely as possible. Then if the sac cannot be removed *in toto* the ovum must be removed and the rawed inner surface closed by means of continuous suture.

In cases of broad ligament gestations which have advanced beyond the fourth month, the procedure is different. Operation should be carried out at once.

There is increased discomfort and risk to the patient in waiting until full time, and, as regards the child, there is great uncertainty. Ectopic children are usually very weak.

It may be possible to open into the gestation sac without entering the peritoneal cavity because of the elevation of the peritoneum above the pelvis in these cases.

The incision should therefore be made in the lower part of the abdomen and on the side where the gestation is highest.

If in making the opening the peritoneum should be cut, it should be at once closed before the gestation sac is opened by an incision which is extra-peritoneal. The fœtus is removed along with the liquor amnii, the umbilical cord being ligatured close to it. The cavity is then stuffed with iodoform gauze. In four or five days this is removed and the placenta taken away. In cases where the placenta is situated on the anterior wall of the sac and is therefore divided, hæmorrhage may be very severe. In such a case, the child should be removed quickly, and the placenta, if possible, taken away, the cavity being firmly stuffed with gauze. If the bleeding is very great, the packing must be done at once, the placenta, or most of it, being left *in situ*. It can be removed after a few days.

In cases where the fœtus has been dead for some time previous to the operation, the placenta may, usually, be safely removed along with the fœtus.

Sometimes, after rupture of a tubal pregnancy into the broad ligament, a secondary rupture takes place into the peritoneal cavity. In these cases, abdominal section must be performed, and the treatment carried out as already described in connection with simple ruptured tubal pregnancies, and with sub-peritoneo-pelvic pregnancies. The whole sac should be taken away, when possible. When this cannot be done, the tear in the sac should be stitched to the abdominal wound, if it be near enough. If it be too far removed, it should be closed with catgut, and the anterior part of the sac stitched to the abdominal incision,

after cleansing of the peritoneum. The sac is then opened and treated as already described.

4. *Ectopic pregnancy which has reached full term or has passed it.*—Abdominal section should be performed as in advanced sub-peritoneo-abdominal cases. It is not necessary to wait until spurious labour sets in, unless it is wished that the child should die so that an operation may be carried out afterwards with more safety, because of the greater ease with which the placenta may be removed in such a circumstance.

If a living child is desired nothing is gained by waiting for a spurious labour.

In a case where spurious labour has occurred and the child has died, abdominal section should be performed as already described. Generally, the placenta may be removed along with the dead fœtus. The cavity should be stuffed with iodoform gauze, which should be gradually diminished in quantity after the operation.

When mummification, adipocere- or lithopœdion-formation has taken place, abdominal section should be carried out, the fœtal mass being removed from the sac in which it lies. Iodoform gauze should be introduced and gradually diminished afterwards.

5. *Ectopic pregnancy in which suppuration has occurred.*

The gestation sac must be opened. The vagina or abdominal wall may be chosen for the incision. The vaginal opening may be made in an early pregnancy if the fœtus be macerated, and the collection of pus bulges into the vagina. In all other cases it is best to open into the pus cavity through the abdomen, taking care to make the incision so as to avoid making a communication with the

peritoneal cavity. The contents of the sac are to be removed while it is washed out with an antiseptic lotion and drained with iodoform gauze.

In cases in which the pus has already burst through to the surface the treatment may be more difficult.

When the abdominal wall has been opened the sinus should be enlarged in order that the fœtal debris may be removed. The same course may be adopted when the pus has burst into the vagina.

When the bladder has been opened into, or both bladder and vagina, an enlargement should be carried out, if it can be done safely, so as to remove the bones of the fœtus.

If there is risk of injuring the ureters, an opening should be made into the suppurating cavity through the abdominal wall, above the symphysis pubis. This should be carried out extra-peritoneally.

When the rectum has been opened, it may be possible to dilate the anus so as to remove the fœtal bones and wash out the sac. If this be not possible, a fresh vaginal or abdominal opening may be made in order to empty the cavity.

6. *Ectopic combined with intra-uterine pregnancy.*

If the ectopic pregnancy be of old standing—*e.g.*, a lithopœdion—its presence may simply cause an artificial emptying of the uterus. Or, if the case goes on to full time the ectopic mass causes trouble in the labour, so that artificial delivery is necessary.

When the ectopic pregnancy is active as well as the other the condition is a grave one. Abdominal section should be performed, and either the ectopic mass alone be removed, or both ectopic along with the uterine pregnancy. Opera-

tion should be advised as early as possible after the condition is diagnosed.

7. *Pregnancy in a rudimentary horn of a malformed uterus.*

Abdominal section should be performed as soon as the condition is recognised. The treatment is the same as in cases of tubal pregnancy.

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